CERAMBYCIDAE OF NORTHERN ASIA

VOLUME 3

LAMIINAE

PART I

A I CHEREPANOV

This volume contains general information about the subfamily Lamiinae. Keys to tribes within the subfamily are presented on the basis of different stages of development. Also presented are keys to genera and species in the tribes Dorcadionini, Lamiini, Monochamini, Ancylonotini, Mesosini, Dorcaschematini, Hecyrini, Pteropliini, and Apomecynini. The morphology, biology, trophic relations, characteristic features of interstadial development, and other aspects of the species are described and the role of these insects in the biocenosis highlighted.

The book is intended for forestry specialists, entomologists, and ecologists.

Cerambycidae of Northern Asia

Volume 3, Part I

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CERAMBYCIDAE OF NORTHERN ASIA

VOLUME 3

Lamiinae

Part I

[*Usachi Severnoi Azii* (*Lamiinae*)]

A.I. CHEREPANOV

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Scientific Editor
G.S. ZOLOTARENKO
Doctor of Biological Sciences

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FOREWORD

Publication of *Cerambycidae of Northern Asia* continues, based on materials collected by the author over many years of fieldwork in extensive areas of Siberia, the Urals, and the Far East. The first volume of this work, devoted to the subfamilies Prioninae, Disteniinae, Lepturinae, and Aseminae, was published in 1979. The second volume incorporated the results of investigations on the subfamily Cerambycinae and was published in two parts. The first part, containing 11 tribes (Hesperophanini—Callidiini), was brought out in 1981 and the second part, containing information on two tribes (Clytini, Stenaspini), in 1982.

Volume III is devoted to the subfamily Lamiinae and is divided into three parts. In the first part, identification key to tribes of the subfamily Lamiinae is presented on the basis of different developmental stages and details given of the morphology, geographic distribution, and biology of the genera and species constituting the tribes Dorcadionini—Apomecynini. In a similar format, the second part includes the tribes Pterycoptini—Agapanthiini, and the third part the tribes Saperdini—Tetraopini.

N.E. Cherepanova actively participated in extensive field and laboratory investigations as well as selection of materials. Drawings illustrating morphological characteristics of the species were done by the artist A.Z. Ermolenko and are mostly original, with only some published earlier in other works. A.L. Pakhotskaya assisted in the preparation of the manuscript for the press, while students N.N. Zyablitskaya, O.A. Shatilov, and others undergoing field training participated in the collection of research materials. The author expresses his deep gratitude to all his colleagues.

SYSTEMATIC LIST OF CERAMBYCID BEETLES

Family CERAMBYCIDAE

VI. Subfamily Lamiinae

25. Tribe Dorcadionini

1. Genus *Plectrura* Mannh.

1. *P. metallica* Bat. 17

2. Genus *Dorcadion* Dalm.

1. *D. politum* Dalm. 27
2. *D. cephalotes* Jak. 33
3. *D. elegans* Kr. 38

3. Genus *Eodorcadion* Breun.

1. *E. humerale* (Gebl.) 48
2. *E. carinatum* (F.) 52
3. *E. lutschniki* (Plav.) 59
4. *E. grumi* (Suv.) 65
5. *E. ptyalopleurum* (Suv.) 71
6. *E. leucogrammum* (Suv.) 77
7. *E. quinquevittatum* (Hamm.) 84
8. *E. brandti* (Gebl.) 90

26. Tribe Lamiini

1. Genus *Lamia* F.

1. *L. textor* (L.) 92

2. Genus *Lamiomimus* Kolbe

1. *L. gottschei* Kolbe 99

27. Tribe Monochamini

1. Genus *Monochamus Guer.*

1. *M. sutor* (L.) 111

2. *M. galloprovincialis* (Oliv.) 119
3. *M. urussovi* (Fisch.) 126
4. *M. grandis* Waterh. 133
5. *M. saltuarius* Gebl. 140
6. *M. impluviatus* Motsch. 147
7. *M. nitens* (Bat.) 153
8. *M. guttatus* Bless. 155

2. Genus *Acalolepta* Pasc.

1. *A. luxuriosa* (Bat.) 164
2. *A. cervina* (Hope) 170
3. *A. sejuncta* (Bat.) 172
4. *A. ussurica* (Plav.) 179
5. *A. degenera* (Bat.) 185

28. Tribe Ancylonotini

1. Genus *Palimna* Pasc.

1. *P. liturata* (Bat.) 191

29. Tribe Mesosini

1. Genus *Mesosa* Latr.

1. *M. myops* (Dalm.) 201
2. *M. japonica* Bat. 208
3. *M. curculionoides* (L.) 212
4. *M. senilis* Bat. 216
5. *M. hirsuta* Bat. 221

30. Tribe Dorcaschematini

1. Genus *Olenecamptus* Chevr.

1. *O. octopustulatus* (Motsch.) 229
2. *O. clarus* Pasc. 235

31. Tribe Hecyrini

1. Genus *Moechotype* Thoms.

1. *M. diphysis* (Pasc.) 241

32. Tribe Pteropliini

1. Genus *Pterolophia* New.

1. *P. ussuriensis* Plav. 250
2. *P. maacki* (Bless.) 256
3. *P. jugosa* Bat. 259

2. Genus *Egesina* Pasc.

1. *E. bifasciana* (Matsush.) 265

33. Tribe Apomecynini

1. Genus *Asaperda* Bat.

1. *A. agapanthina* Bat. 271
2. *A. meridiana* Matsush. 280
3. *A. rufipes* Bat. 282
4. *A. stenostola* Kr. 286

2. Genus *Microlera* Bat.

1. *M. ptinoides* Bat. 292
2. *M. ussuriensis* Tsherepanov, sp. n. 293

SPECIAL PART

VI. Subfamily Lamiinae

6 *Adults*: Body large (some Monochamini), medium (Mesosini, many Saperdini, and others) or very small (Tetraopini), stocky (Lamiini) or highly elongate (Agapanthiini, some Phytoeciini), or virgate (Hippopsini). Head perpendicular or even inclined, medially with a longitudinal groove extending from frons to posterior margin of occiput. Antennal tubercles more (Monochamini) or less (Saperdini) produced. Antennae generally longer than body, in some members of Monochamini, Acanthocinini, and Hippopsini two–three times longer than body, rarely short, extending only beyond middle of elytra or barely reaching them (Lamiini). Eyes deeply emarginate, divided into upper and lower lobes, with narrow groove between lobes or even without groove (Tetraopini).

Pronotum laterally with well-developed, often spiniform tubercle (Dorcadionini, Monochamini, majority of Apodasyini, and others) or without tubercle, in which case generally parallel-sided (Agapanthiini, Saperdini, Phytoeciini, and others). Pronotal shield small, flat, with barely noticeable, longitudinal, troughlike groove, apically rounded, rarely obtuse (some Phytoeciini).

Elytra slightly (Dorcadionini, Mesosini), moderately (Monochamini, Apodasyini) or highly (Hippopsini, Agapanthiini, Phytoeciini) elongate, parallel-sided or slightly tapering toward apex, apically individually or jointly rounded or obtuse or incised (some Pogonocherini, Apodasyini), sometimes with acicular, highly produced outer angle (Gleneini). Hind wings membranous, well developed, only in Dorcadionini rudimentary, present in form of small scales. Legs comparatively long. Femora uniformly thickened (Dorcadionini, Monochamini, Dorcaschematini, Phytoeciini, and others) or sharply thickened (dilated), clavate in second half (Acanthocinini, Acanthoderini, some Apodasyini). Foretibiae of males (some Monochamini) considerably longer than remaining ones. Midtibiae on outer margin (Monochamini, Lamiini, and others) with distal notch covered with bristles forming compact brush, or without notch, uniform (Mesosini, Hecyrini, Pterycoptini, and others). Tarsi with well-developed setigerous area. Foretarsi of males (Monochamini and others) more enlarged.

Eggs: White, in some members with greenish tone, elongate, straight or slightly curved, and rounded at poles; in many representatives more tapering toward caudal pole. Chorion smooth, lustrous, semitransparent or matte, finely sculptured.

Larvae: Body white, sometimes with yellowish hue, large (some Mono-
chamini), medium (Mesosini), small (Pogonocherini) or very diminutive
(Tetraopini), straight or bent (Hippopsini, Agapanthiini). Head generally
7 parallel-sided, dorsoventrally flat, half or less retracted into prothorax. Epis-
toma laterally demarcated by frontal sutures (sutura frontalis) or fusing
with temporo-parietal lobes (in which case, frontal sutures not noticeable),
medially divided by distinct longitudinal suture (sutura medialis). Hypo-
stoma transverse, parallel-sided or distinctly tapering toward base, entire,
rarely with transverse, sharply convex collar, even more rarely with one
or two pairs of denticular spinules (some Mesosini). Temporo-parietal lobes
in anterior half with sparse solitary setiform hairs. Antennae very short,
their apices barely projecting from antennal socket. Below base of anten-
nae ampullaceous ocellus occurs on each side. In some members of Pog-
onocherini and Saperdini, ocelli not noticeable or indistinct. Mandibles
produced, apically obliquely truncate, sometimes slightly incised, with more
or less produced ventral and obtuse dorsal denticle, ventrally with ridge
extending obliquely from ventral denticle toward dorsal margin. Clypeus
large, trapezoid. Labrum transversely oval, sometimes slightly produced,
at anterior margin obtuse or broadly rounded, in anterior half with dense
short or long bristles. Labium and maxillae fused into common labio-
maxillary complex.

Pronotum transverse, rarely slightly longer than wide, laterally rounded, sloping toward head, at anterior margin with white fringe, behind which on disk and laterally with hairs forming transverse band or transverse row. Pronotal shield generally convex, laterally demarcated by short longitudinal grooves (folds), at anterior margin rounded or uniformly transversely truncate, often (Monochamini, Lamiini, Dorcadionini, and others) anterior angles emarginate, here with transverse notch uniting posteriorly with lateral longitudinal groove, coriaceous (not sclerotized or sclerotized), with minute dense spinules forming common hard crust (Lamiini, Monochamini, and others) or with large transversely enlarged, apically rounded, backwardly directed spinules forming common stridulatory field (Saperdini, Gleneini, Phytoeciini); in some representatives of Phytoeciini with additional oblique deep dark brown grooves extending almost from middle of shield toward anterior angles of pronotum. Presternum with sparse or dense rusty or ginger-rust hairs. Eusternum convex, demarcated by distinct deep groove, coriaceous, glabrous or with short hairs, sometimes basally (Monochamini and others) sclerotized or with minute spinules (Saperdini). Base of prosternum (basisternum s. sternellum) laterally with short hairs, disk glabrous, coriaceous or distinctly sclerotized; in members of Saperdini often with minute spinules in one–three transverse rows. Thoracic legs absent.

Abdomen moderately (Dorcadionini and others) or highly (Hippopsini, Phytoeciini) elongate, toward apex distinctly tapering or parallel-sided. Locomotory ampullae well developed on segments I–VII, present on both dorsal and ventral sides (Dorcadionini, Phytoeciini, and others) or only on dorsal side (Agapanthiini). Dorsal locomotory ampullae with ampullaceous granules forming four (Monochamini), three (Mesosini) or two (Dorcaschematini, Apodasyini, and others) transverse rows, or without ampullaceous granules, divided by two transverse grooves bound by transverse ridge, with numerous minute spinules (Saperdini) or without them, compactly sclerotized (Lamiini) or coriaceous (Dorcadionini). Ventral locomotory ampullae divided by transverse groove, coriaceous (Dorcadionini and others) or with minute sclerotized spinules (Saperdini and others), 8 with distinct (Monochamini, Apodasyini, and others) or indistinct granules in two transverse rows. Abdominal tergite IX sparsely pilose, apically with spinule (many Apodasyini, Mesosini, and others) or with large projection terminating in spinule (Hippopsini) or with two well-developed spinules (Hecyrini) or without spinules. In Agapanthiini, some Apodasyini and Hippopsini, abdominal segment IX short, cylindrical, apically obtuse, in second half with long dense hairs forming almost continuous ring or tuft (visible in posterior view). Anal pore transverse (Dorcadionini, Lamiini) or triradiate. In some representatives (Mesosini, Phytoeciini, and others), all rays uniformly developed, in others (some Monochamini), ventral ray short, lateral rays much longer.

Pupae: Characterized by diversity of shape of antennae, pronotum and abdomen, degree of development of urogomphus, and other characters. Body white, sometimes with yellowish tone, broad, comparatively stocky (Dorcadionini, Monochamini, Mesosini, and others), or narrow, highly elongate (Hippopsini, Agapanthiini, Phytoeciini, and others). Head moderately hypognathous with more (Monochamini and others) or less (Saperdini and others) produced antennal tubercles, medially with longitudinal groove, frontally with sparse thin or coarse acicular bristles or (in some members of Monochamini, Dorcaschematini, Ancylonotini) with spinules. Antennae long, their bases flexed laterad, and bent ventrad in median third; here, along sides of body spiraled (Monochamini, Ancylonotini, Dorcaschematini), or curved annularly (Mesosini, Pterycoptini, Pogonocherini, Acanthoderini, and others), semicircularly (Dorcadionini, Hecyrini, and others), or form a loop; in the last case, their apices inclining toward sides of head (Apomecynini) or encircling head, in front flexed toward anterior margin or toward sides of pronotum (Agapanthiini, some Acanthocinini). Antennae in Hippopsini form longitudinal ring flexed laterad on ventral side of body; in Pteropliini (*Pterolophia* Newm.) and Apodasyini (*Anaesthetis* Muls.), their apices inclining toward abdominal sternites behind hind tarsi.

Pronotum transverse or square (Mesosini, Acanthoderini, and others) or distinctly oblong (Hippopsini, Dorcaschematini, Agapanthiini, and others), laterally with produced tubercle (Dorcadionini, Lamiini, Monochamini, Ancylonotini, and others), or without tubercle (Mesosini, Agapanthiini, Phytoeciini, Tetraopini, and others), disk with bristles (Dorcadionini, Agapanthiini, Apomecynini, Phytoeciini, and others) or spinules (Monochamini, Hecyrini, Acanthoderini, some Acanthocinini, and others).

Abdomen broad, toward base slightly, toward tip more tapering (Dorcadionini, Lamiini, and others), or highly elongate, parallel-sided (Hippopsini, Agapanthiini, Phytoeciini). Abdominal tergites with numerous dense bristles forming an extensive paramedial cluster (Lamiini, Dorcadionini) or with spinules forming transverse band in posterior half or one–two transverse rows (Monochamini, Mesosini, Hecyrini, Pteropliini, Pterycoptini, Acanthoderini, and others), or with sparse bright bristles (Tetraopini and others). Spinules on abdominal tergites generally short, straight (Monochamini, Mesosini, and others), or long, thin, apically falcate (Agapanthiini). Abdominal tergite IX apically with large urogomphus terminating in acute spinule (Dorcadionini, Lamiini, Monochamini, Ancylonotini, Pogonocherini, and others), or without it, in which case tip of abdomen (in ventral view) obtuse, laterally bound by ridge covered with long bristles or setigerous spinules (Mesosini, Pterycoptini, Saperdini, Gleneini, Phytoeciini). In Hecyrini, abdominal tergite IX at apex with two large projections 9 bearing two terminal spinules diverging laterally. Valvifers of female small, hemispherical, contiguous.

Biology: Adults of some representatives (Dorcadionini), having underdeveloped hind wings, are not able to fly, live in colonies, and generally occupy localized areas. Most of the other tribes (Monochamini, Acanthocinini, Phytoeciini, and others) are able to fly (sometimes fly considerable air distances), and often migrate from one area to another comparatively distant place. For maturation of gonads, beetles generally require supplementary feeding. Some insects (Dorcadionini: *Dorcadion* Dalm., *Eodorcadion* Breun., and others) feed on tissues of green leaves of cereals; others (Monochamini, Mesosini, Acanthocinini, and others) feed on the bark and bast tissues of thin shoots of woody and bushy species; and a third category (Agapanthiini, many Phytoeciini—*Phytoecia* Muls.) feeds on tissues of shoots or leaves of cruciferous, thistlelike and other herbaceous plants, leaving injuries in the form of narrow bands.

The period of reproduction lasts not less than two months: May–June (some Dorcadionini, Mesosini, and others) or June–July, rarely August (many Monochamini, Dorcaschematini, Pogonocherini, and others); only in some species (*Monochamus urussovi* Fisch., *Saperda carcharias* (L.)) is it quite prolonged, continuing from June to September-end. Fecundity of beetles comparatively low. A female can lay from 6–10 to 25–36 eggs, rarely more, during her life span. For oviposition, the female first uses its mandibles to nibble an infundibular or elongate depression (cavity) in the shoot, then turns its abdominal tip toward the cavity, inserts its ovipositor, and lays an egg under the bark or in the heartwood of the shoot. Generally, one egg is laid per cavity. Sometimes these cavities remain unoccupied. Species of *Monochamus* Guer. occupy stems and knots of woody plant species; *Oberea* Muls., *Tetrops* Steph., and others—thin shoots of woody and bushy plants; *Agapanthia* Serv., *Phytoecia* Muls.—stems of herbaceous plants; *Dorcadion* Dalm., *Eodorcadion* Breun.—underground part of stems of grasses, and so on. The egg stage, depending on temperature fluctuation, lasts two–four weeks.

Larvae live from one to three years. They initially make galleries under the bark, then in the wood, and pack them compactly with frass (many Monochamini, Mesosini, Acanthocinini, Apodasyini, Pogonocherini, Pteropliini, and others); or while advancing along the heartwood of the shoot, they nibble ventilation holes in the wall and jettison the frass through them. In the latter case, the gallery remains empty and the larva moves freely in it from one end to the other (many Phytoeciini, some Saperdini, Apomecynini, and others). The frass thrown out by the larvae may be coarse and fibrous (*Monochamus* Guèr. and others) or fine and granular (*Oberea* Muls. and others). It accumulates in small heaps on damaged stems (shoots). Having tunnelled a gallery, the larva next makes a pupal cell at the end of it and pupates inside this cell.

Based on the duration of pupation, Lamiinae may be divided into two phenological groups. The first group includes species (many Monochamini, Saperdini, Phytoeciini, and others), which pupate in the first half of summer. These species hibernate as larvae of first, mid- or late instar. Beetles live for two–four weeks or a little longer. The second group comprises species (*Dorcadion* Dalm., *Plectrura* Mannh., *Xylariopsis* Bat., and others) which pupate in the second half of summer and hibernate as larvae or adults. Beetles live, on average, to ten months of age. Only some individual species (*Pseudocalamobius* Kr.) remain in the pupal stage during the second or third winter. Beetles emerge in spring with the commencement of warmth. They live up to four weeks. In some species (*Plectrura* Mannh., *Xylariopsis* Bat., and others), the beetles exit from the pupal cell one–two weeks after emergence and move to forest litter for hibernation, while in other species (*Dorcadion* Dalm. and others), they remain in the pupal cell during winter and emerge only in the following spring.

In the larval stage, most species of Lamiinae are trophically associated with woody and bushy plants (Table 1). Of these, up to 15 species (many *Monochamus* Guèr., *Acanthocinus* Guèr., some *Pogonocherus* Zett., and others) live on conifers, while 80 species (Apodasyini, Mesosini, Pteropliini, Pterycoptini, Tetraopini, many Acanthocinini, Saperdini, and others) live on deciduous woody and bushy plants. Only slightly more than 40 species are trophically associated with herbaceous plants; moreover, some of them (*Dorcadion* Dalm., *Eodorcadion* Breun.) infest cereal grasses and the larvae live in the grass sod; others (*Agapanthia* Serv., *Phytoecia* Muls., and others) infest thistles, umbellifers, spurges, and other plants, and the larvae develop in the stems and make galleries in the heartwood.

Economic importance: Long-horned beetles of the subfamily Lamiinae are of paramount importance in the economics of nature. A vast majority of these species inhabit forest stands. Some of them are highly numerous and inflict considerable damage to standing timber. Beetles feeding on the bark and bast tissues of young shoots rarefy the canopy, cause physiological weakening of trees, and reduce their resistance to attack by secondary pests. As a result of supplementary feeding, the maximum damage is caused by *Monochamus urussovi* (Fisch.) to fir and by *M. sutor* (L.) to spruce plantations. According to the observations of S.S. Prozorov (1958), a single beetle of *Monochamus urussovi* (Fisch.) during its life span can remove a total area of more than 6,000 mm² of bark from the shoots and damage more than 2,000 conifers. Of no less significance are those long-horned beetles (*Pogonocherus fasciculatus* (Deg.), *P. costatus* Motsch., and others) whose larvae live in young shoots of growing trees. Appearing in large numbers, they rarefy the tree canopy, cause drying of heads, and so forth.

Foci of mass reproduction of long-horned beetles (*Monochamus* Guèr., *Acanthocinus* Guèr., and others) appear in forests weakened by primary 11 pests or damaged by forest fire or logging. For example, large foci of mass reproduction of *Monochamus urussovi* (Fisch.) were noticed in fir forests damaged by the Siberian silkworm moth in Gornaya Shoriya in 1929, in Krasnoyarsk territory, Novosibirsk, Kemerov and Tomsk districts during 1955–1959, in spruce forests damaged by the spruce moth (*Boarmia bistortata* Goeze) in the southern part of Krasnoyarsk territory (Tubinsk massive) during 1932–1933, and so on. Foci of *Monochamus urussovi* (Fisch.), appearing in forests damaged by primary pests (*Dendrolimus sibiricus* Tschetv., *Boarmia bistortata* Goeze), thereafter continue to exist for a long time spontaneously. Moreover, since the beetles during supplementary feeding rarefy the canopy, they create favorable conditions for the development of larvae on new trees. This leads to the expansion of boundaries of the existing foci of the pest.

Table 1. Host plant distribution of Lamiinae in the larval stage

Tribe	Total species	Distribution on plants, %			
		Conifers	Deciduous	Herbaceous	Unidentified
25. Dorcadionini	12	—	8.2	91.8	—
26. Lamiini	2	—	100	—	—
27. Monochamini	13	53.8	30.8	7.7	7.7
28. Ancylonotini	1	—	100	—	—
29. Mesosini	5	—	100	—	—
30. Dorcaschematini	2	—	100	—	—
31. Hecyrini	1	—	100	—	—
32. Pteropliini	4	—	100	—	—
33. Apomecynini	6	—	50	—	50
34. Pterycoptini	2	—	100	—	—
35. Apodasyini	11	—	63.6	—	46.4
36. Pogonocherini	7	57.1	28.6	—	14.3
37. Acanthoderini	1	—	100	—	—
38. Acanthocinini	19	15.8	68.4	—	15.8
39. Hippopsini	1	—	100	—	—
40. Agapanthiini	13	—	—	92.3	7.7
41. Saperdini	23	4.3	91.4	4.3	—
42. Gleneini	1	—	100	—	—
43. Phytoeciini	25	—	12	56	32
44. Tetraopini	3	—	100	—	—
Common indices	152	9.9	51.3	25.7	13.1

Foci of mass reproduction of *Monochamus galloprovincialis* Oliv. and *Acanthocinus aedilis* (L.) were observed in pine strip groves of Kulunda (in cinders and "drenches") in 1950 and in the submerged (drying) pine forests in the region of Novosibirsk reservoir during 1959–1962. Almost all the stems of dead pine trees were attacked by the larvae of these species.

During 1950–1954 *Saperda carcharias* (L.) and *S. populnea* (L.) appeared in large numbers in natural forests and field protection forest belts of Kulunda. Initially, 28.1 to 93.2% of the growing poplar trees were attacked, then up to 80% of the trees in the old forest belts, and up to 94% shoots of the saplings of poplar forest nurseries. Considerable damage is caused by *Mesosa myops* (Dalm.) in the field-protection forest belts of southern regions of western Siberia including Kazakhstan. In fact, this insect infests all deciduous woody species present in the forest field-protection plantations. Elm (*Ulmus*) suffers the most from it, while willow, poplar, and other plants suffer less. In 1951, in the forest belts of Kulunda, at places 50% of the stems of elm were infested by this pest, of which 45% died.

Larvae of long-horned beetles developing on the stems of trees cause extensive technical damage. In some species (*Mesosa myops* (Dalm.) and others), the larvae live their entire life under the bark or in it, tunneling galleries below it; they introduce fungal spores that cause blackening and wood rot. In other species (*Monochamus* Guèr., *Acanthocinus* Guèr., and others) the larvae, in midlife or at the end of their life, bore into the wood, pierce it transversely or longitudinally, and render it unsuitable for technical (particularly construction) purposes. Wood prepared as logs and left in felling areas as such is colonized by long-horned beetles in a period of one year and soon loses its qualities to such an extent that it is fit only for fuel. A conclusion may be drawn from this fact, namely, freshly prepared wood should be transported from the felling area in the shortest time possible and in no case be left there for very long.

KEY TO TRIBES

Adults

1 (20). Pronotum laterally with produced (only in some Apomecynini, Apodasyini, Acanthocinini indistinct) tubercle.

2 (3). Hind wings underdeveloped, in form of small scales. . . . . **25. Dorcadionini**

3 (2). Hind wings well developed, folded under elytra.

4 (19). Midtibiae at outer margin with distal notch covered with bristles forming dense brush.

12 5 (10). Femora not clavate, moderately thickened.

6 (7). Antennae basally thick, toward apex markedly thin, extending only beyond middle of elytra. . . . . 26. **Lamiini**

7 (6). Antennae thin, notably longer than body.

8 (9). Body black, dark brown or monochromatic rust. Elytra on black background with whitish (gray) pilose spots or without them. . . . . 27. **Monochamini**

9 (8). Body black with whitish-gray pubescence. Elytra on bright gray background with black pilose spots creating variegated color. . . . . 28. **Ancylonotini**

10 (5). Femora clavate, in second half comparatively sharply thickened, as though dilated.

11 (14). Cavities of midcoxae open.

12 (13). Claws adjacent, diverging at acute angle, not opposite to each other. . . . . 33. **Apomecynini**

13 (12). Claws diverging at obtuse angle, opposite to each other, rapacious . . . . 35. **Apodasyini (Rhodopinini)**

14 (11). Cavities of midcoxae closed.

15 (16). Elytra in posterior half with bristles forming two–three bundles in longitudinal row, apically truncate or incised, in some representatives with outer angle acicularly produced. . . . . 36. **Pogonocherini**

16 (15). Elytra in posterior half without bundles of bristles, apically rounded, truncate or slightly incised.

17 (18). First antennal segment highly thickened, pyriform. . . . . 37. **Acanthoderini**

18 (17). First antennal segment elongate, almost cylindrical, toward apex barely thickened. . . . . 38. **Acanthocinini**

19 (4). Midtibiae at outer margin without distal notch, only with much denser bristles.. . . . . 31. **Hecyrini (Crossotini)**

20 (1). Pronotum laterally without produced tubercle, generally parallel-sided.

21 (36). Tarsal claws simple, not bifurcate, on inner side at most with small basal tubercle.

22 (35). Body broad, stocky or ridgelike. Femora not clavate, elongate.

23 (26). Body broad, stocky; midtibiae at outer margin without distal notch.

24 (25). Length of body 8–15 mm. . . . . 29. **Mesosini**

25 (24). Length of body up to 8 mm. . . . . 32. **Pteropliini**

26 (23). Body elongate, ridgelike.

27 (34). Elytra apically not incised, jointly or individually rounded.

28 (29). Antennae thin, filamentous, 2.0–2.5 times longer than body. Pronotum markedly longer than wide . . . .

.... 30. **Dorcaschematini**

29 (28). Antennae comparatively thick, not filamentous, barely longer or shorter than body.

30 (31). Elytra apically produced (*Xylariopsis* Bat.) or on hind clivus compressed, resembling a wheelbarrow (*Doius* Mats.)...................................... 34. **Pterycoptini**

31 (30). Elytra apically not produced, on hind clivus not compressed, gradually sloping.

32 (33). Antennae 12-segmented.................. 40. **Agapanthiini**

33 (32). Antennae 11-segmented.................... 41. **Saperdini**

34 (27). Elytra apically deeply incised, with acicular, acutely produced outer angle .... 42. **Gleneini**

35 (22). Body thin, virgate. Femora clavate. Antennae very thin, filamentous, notably longer than body; 1st antennal segment quite
13 thick.................................. 39. **Hippopsini**

36 (21). Tarsal claws bifurcate or split, on inner side with notch separating an acute dent from basal part of claw.

37 (38). Body medium-sized, more elongate. Eyes deeply emarginate, between ocular lobes with faceted lacertus....................................... 43. **Phytoeciini**

38 (37). Body diminutive, insignificantly elongate. Eyes completely divided, between ocular lobes without faceted lacertus, at most with smooth band....................... 44. **Tetraopini**

Larvae

1 (4). Anal pore transverse or triradiate (*Plectrura metallica* Bat.).

2 (3). Pronotal shield coriaceous, not sclerotized, white, only in some representatives slightly sclerotized, yellowish. In soil; ecologically associated with herbaceous plants; only *Plectrura metallica* Bat. develops under bark of deciduous woody plant species.................................. 25. **Dorcadionini**

3 (2). Pronotal shield not coriaceous, compactly sclerotized, rusty or yellowish. In wood; ecologically associated with deciduous plant species................................. 26. **Lamiini**

4 (1). Anal pore triradiate (one ventral and two lateral rays), only in some representatives (*Monochamus urussovi* (Fisch.)) ventral ray short.

5 (38). Abdominal tergites III–VI without spinules, laterally only with thin bright or rusty hairs.

6 (33). Pronotal shield coriaceous or compactly sclerotized, with very minute spinules visible under high magnification.

7 (28). Body not curved, straight, comparatively thick, tapering posteriorly. Abdominal segment IX not cylindrical, tapering posteriorly, with hairs not forming continuous annular tuft (visible in posterior view). Locomotory ampullae well developed on dorsal and ventral sides of abdomen.

8 (25). Dorsal locomotory ampullae distinctly granular.

9 (18). Locomotory ampullae on dorsal side of abdomen with three–four transverse rows of granules.

10 (13). Granules on dorsal locomotory ampullae in four transverse rows.

11 (12). Spiracles elongate, measurements 2 : 1 (*Monochamus* Guèr.) or round, at ends uniformly rounded, not tapering downward. . . . . 27. **Monochamini**

12 (11). Spiracles more rounded, measurements 1.5 : 1, at upper end gently, at lower end narrowly rounded, distinctly tapering downward. . . . . 28. **Ancylonotini**

13 (10). Granules on dorsal locomotory ampullae in three rows or common transversely elongate oval cluster.

14 (17). Granules on dorsal locomotory ampullae in three transverse rows.

15 (16). Abdominal tergite IX apically with one well-developed or in some representatives barely perceptible spinule. . . . . 29. **Mesosini**

16 (15). Abdominal tergite IX apically with two well-developed spinules. . . . . 31. **Hecyrini**

17 (14). Granules on dorsal locomotory ampullae in transversely elongate oval cluster. . . . . 37. **Acanthoderini**

18 (9). Locomotory ampullae on dorsal side with ampullaceous granules
14 in two transverse rows divided by groove.

19 (20). Hypostoma transversely convex, tapering toward base, at anterior angles broadly rounded. . . . . 30. **Dorcaschematini**

20 (19). Hypostoma uniformly convex or flat, parallel-sided, at anterior angles narrowly rounded.

21 (22). Epistoma at anterior margin only along sides with longitudinal striation or without it, but then abdominal tergite IX apically with acute spinule (*Pterolophia jugosa* Bat., *Egesina bifasciana* (Matsush.)) . . . . 32. **Pteropliini**

22 (21). Epistoma at anterior margin along sides without striation or throughout entire width with short longitudinal ridges.

23 (24). Tip of abdomen with long dense hairs, appears densely pilose. . . . . 34. **Pterycoptini**

24 (23). Tip of abdomen sparsely pilose, only in *Anaesthetis* Muls. tergite IX with hairs almost throughout surface . . . . 35. **Apodasyini**

25 (8). Dorsal locomotory ampullae not granular, only in some repre-

sentatives (*Eryssamena* Bat. and others) with granules in two transverse rows.

26 (27). Abdominal tergite IX apically with longitudinally or transversely elongate, oval sclerotized plate. . . . . 36. **Pogonocherini**

27 (26). Abdominal tergite IX apically with an acute spinule or without it. Dorsal locomotory ampullae not granular (*Exocentrus* Muls., *Acanthocinus* Guèr.) or with granules in two transverse rows (*Leiopus* Serv., *Eryssamena* Bat., *Miaenia* Pasc.) . . . . 38. **Acanthocinini**

28 (7). Body distinctly curved, not tapering posteriorly. Abdominal segment IX short, cylindrical, at posterior margin obtuse, here with long dense hairs forming crown along entire circumference.

29 (32). Locomotory ampullae developed on dorsal and ventral sides of abdomen.

30 (31). Abdominal tergite IX apically without large spinule . . . . 33. **Apomecynini**

31 (30). Abdominal tergite IX apically with large spinule (visible in lateral view). . . . . 39. **Hippopsini**

32 (29). Locomotory ampullae developed only on dorsal side. . . . . 40. **Agapanthiini**

33 (6). Pronotal shield with large, or with minute (but visible under low magnification) spinules.

34 (37). Pronotum laterally without oblique dark rust grooves. Dorsal locomotory ampullae with very minute spinules divided by two transverse grooves that unite laterally at an acute angle, thus demarcating medial transversely elongate ridge.

35 (36). Metanotum with distinct transverse groove. . . . . . 41. **Saperdini**

36 (35). Metanotum without transverse groove, medially covered with minute spinules. . . . . 42. **Gleneini**

37 (34). Pronotum laterally with oblique dark rust grooves. Dorsal locomotory ampullae with one or two transverse grooves. . . . . 43. **Phytoeciini**

38 (5). Abdominal tergites III–VI laterally and on disk (behind and partly in front of locomotory ampullae) with numerous spinules . . . . 44. **Tetraopini**

15

Pupae

1 (20). Pronotum laterally with produced tubercle, rarely angularly enlarged (some Apomecynini, Apodasyini, Acanthocinini).

2 (5). Abdominal tergites with long, very dense, rusty, backwardly compressed bristles forming broad field interrupted medially by longi-

tudinal groove; only in one representative (*Plectrura metallica* Bat.) with short spinules in transverse row.

3 (4). Mesonotum glabrous or with solitary bristles. . . . . 25. **Dorcadionini**

4 (3). Mesonotum with numerous bristles forming one obliquely elongate cluster on each side. . . . . 26. **Lamiini**

5 (2). Abdominal tergites with spinules or with sparse, sometimes dense bristles forming transverse band.

6 (9). Antennae in second half on ventral side spiraled.

7 (8). Meso- and metanota with large acicular spinules, only in *Acalolepta degenera* (Bat.) with thick bristles. . . . . 27. **Monochamini**

8 (7). Meso- and metanota almost glabrous, with barely perceptible sparse bristles. . . . . 28. **Ancylonotini**

9 (6). Antennae in second half not spiraled, only downcurved or annular.

10 (11). Abdomen at tip with bifid urogomphi. . . . . 31. **Hecyrini**

11 (10). Abdomen at tip generally with one urogomphus, rarely (*Miccolumia verrucosa* Bat.) with two conical urogomphi or without them (most Acanthocinini).

12 (13). Lateral tubercles of pronotum with dense bristles. Abdominal tergites with long bristles forming one small cluster on each side along medial line. 33. **Apomecynini**

13 (12). Lateral tubercles of pronotum with sparse solitary hairs or without them.

14 (17). Frontal part of head (frons) with acicular bristles.

15 (16). Abdominal tergites in posterior half with spinules and bristles or only with bristles (*Anaesthetis* Muls.) or with short spinules. Pronotum laterally with well- (*Rhopaloscelis* Bless. and others) or barely (*Anaesthetis* Muls.) developed tubercle. Abdomen terminally with urogomphus, rarely without it (*Anaesthetis* Muls.), sometimes (*Miccolamia verrucosa* Bat.) with two conical urogomphi. . . . . 35. **Apodasyini**

16 (15). Abdominal tergites in posterior half without spinules, with barely perceptible lateral bristles. Pronotum laterally with well-developed tubercle. Abdomen terminally with urogomphus. . . . . 36. **Pogonocherini**

17 (14). Frontal part of head with setigerous spinules.

18 (19). Antennae comparatively short, in second half on ventral side annular. Abdominal tergites with large setigerous spinules, tip of abdomen with urogomphus. Ridge bordering abdominal tip laterally with large setigerous spinules. . . . . . 37. **Acanthoderini**

19 (18). Antennae generally long, looped, in some representatives inter-

crossing each other ventrad (*Acanthocinus aedilis* (L.)), rarely
relatively short, annular. Abdominal tergites with minute spi-
16 nules, tip of abdomen generally without urogomphus, rarely (*Exocentrus* Muls.) with urogomphus. Ridge bordering abdominal
tip laterally without spinules. . . . . 38. **Acanthocinini**

20 (1). Pronotum laterally without produced tubercle, parallel-sided or slightly tapering anteriorly.

21 (22). Antennae in second half on ventral side of body spiraled. Tip of abdomen with urogomphus. . . . . 30. **Dorcaschematini**

22 (21). Antennae in second half on ventral side of body not spiraled. Tip of abdomen without urogomphus.

23 (38). Tip of abdomen laterally on ridge (in ventral view) with spinules or with bristles.

24 (25). Antennae in second half bent ventrad, their apices flexed toward abdominal sternites behind hind tarsi or here bent forward, falcate . . . . 32. **Pteropliini**

25 (24). Antennae in second half annular, looped, or semicircular.

26 (35). Antennae annular or looped.

27 (34). Pronotum with short spinules not bent forward or with bristles.

28 (29). Pro-, meso-, and metanota with setigerous spinules. Antennae annular. . . . . 29. **Mesosini**

29 (28). Pronotum with bristles. Meso- and metanota with bristles or without them.

30 (33). Abdominal tergites with simple spinules, not falcate. Antennae annular, their apices not encircling head.

31 (32). Body moderately elongate. Antennae forming broad ring, not longitudinally elongate. Spinules on abdominal tergites in transverse row. Ridge at tip of abdomen with spinules and long bristles. . . . . 34. **Pterycoptini**

32 (31). Body thin, elongate, virgate. Antennae forming longitudinal ellipsoid ring. Spinules on abdominal tergites forming two small paramedial clusters on each side. Ridge at tip of abdomen with long dense bristles, without spinules. . . . . 39. **Hippopsini**

33 (30). Abdominal tergites with long thin falcate spinules. Antennae curved forward, looplike, their apices inclining toward frontal side of head or encircling it, flexed toward anterior margin of pronotum. Ridge at tip of abdomen with long dense bristles, without spinules. . . . . 40. **Agapanthiini**

34 (27). Pronotum with long spinules bent forward. Meso- and metanota with spinules. Ridge at tip of abdomen with setigerous spinules. Abdominal tergites with spinules in transverse row. . . . .
. . . . 42. **Gleneini**

35 (26). Antennae semicircular.

36 (37). Pronotum with large or minute setigerous spinules. Meso- and metanota with spinules. Frontal part of head with thick coarse bristles. . . . . 41. **Saperdini**

37 (36). Pronotum with thin sparse bristles. Meso- and metanota with solitary, barely perceptible bristles or without them. Frontal part of head with thin bristles. . . . . 43. **Phytoeciini**

38 (23). Tip of abdomen laterally on ridge (in ventral view) without spinules and without bristles. Antennae semicircular. Pronotum and abdominal tergites with solitary, barely perceptible bright bristles. . . . . 44. **Tetraopini**

17

25. Tribe DORCADIONINI

Adults: Readily recognized by structure of the first antennal segment and absence of developed membranous hind wings. Body oval. Head with wide-set antennal tubercles. Intermediate sclerite between labrum and clypeus present (*Plectrura* Mannh., *Eodorcadion* Breun.) or absent (*Dorcadion* Dalm.). First antennal segment without cicatrix, apically rounded (*Plectrura* Mannh., *Dorcadion* Dalm.) or with an indistinct cicatrix appearing as a transverse ridge (*Eodorcadion* Breun.). Eyes emarginate, finely faceted. Antennae shorter or barely longer than body. Elytra oval, more or less tapering toward apex and toward base. Membranous wings underdeveloped, present in form of small rudimentary scales.

Larvae: In contrast to other tribes, characterized by the following combination of characters. Body thick (*Dorcadion* Dalm., *Eodorcadion* Breun.) or more elongate (*Plectrura* Mannh.). Head highly (*Dorcadion* Dalm., *Eodorcadion* Breun.) or slightly (*Plectrura* Mannh.) retracted into prothorax. Pronotal shield coriaceous or sclerotized (some species of *Eodorcadion* Breun.), laterally demarcated by deep longitudinal grooves uniting with anterior notches situated before anterior angles or these grooves barely perceptible and transverse notches absent (*Plectrura* Mannh.). Abdomen elongate, almost parallel-sided (*Plectrura* Mannh.) or thick, tapering toward tip. Dorsal ampullae well developed on segments I–VII, with ampullaceous granules (*Plectrura* Mannh.) or smooth, not granular, divided dorsally by two, ventrally by one transverse groove, only ventrally with perceptible elongate granules. Abdominal tergite IX apically with spinule, anal pore triradiate (*Plectrura* Mannh.) or tergite IX without spinule, anal pore transverse (*Dorcadion* Dalm., *Eodorcadion* Breun.).

Pupae: Body weakly elongate, comparatively broad. Head with fully projecting (*Eodorcadion* Breun.) or with insignificantly raised antennal tubercles, between them with deep or flat troughlike groove. Antennae in second half arcuate (*Eodorcadion* Breun.) or semicircular (*Plectrura* Mannh.), their apices flexed ventrad or laterad, with apices barely downcurved (*Dorcadion* Dalm.). Pronotum laterally with large backwardly directed tubercle, disk with large or minute bristles. Abdomen slightly elongate (*Plectrura* Mannh.) or expanded, terminally obtuse, with triangular area (in ventral view) bound laterally by setigerous (*Dorcadion* Dalm., *Eodorcadion* Breun.) or spinous ridge, with dorsal backwardly directed urogomphus. Abdominal tergites in posterior half convex, here with long dense bristles forming broad transverse band (*Dorcadion* Dalm., *Eodorcadion* Breun.) or with short acute setigerous spinules forming transverse row (*Plectrura* Mannh.).

There are three genera of this tribe in the fauna of northern Asia, of which two (*Dorcadion* Dalm. and *Eodorcadion* Breun.) are ecologically associated with herbaceous associations of steppe landscapes in southern regions and one genus (*Plectrura* Mannh.) with woody associations in eastern regions.

18 KEY TO GENERA

Adults

1 (2). Elytra without longitudinal ridges, with smooth tubercles. Clypeus and labrum with intermediate sclerite. . . . . . 1. **Plectrura** Mannh.

2 (1). Elytra generally with longitudinal ridges, without smooth tubercles. Clypeus and labrum without or with intermediate sclerite.

3 (4). Clypeus and labrum without intermediate sclerite. . . . . 2. **Dorcadion.** Dalm.

4 (3). Clypeus and labrum with intermediate sclerite. . . . . 3. **Eodorcadion** Breun.

Larvae

1 (2). Locomotory ampullae of abdomen with ampullaceous granules. Tergite IX of abdomen with spinule. Anal pore triradiate. In forests, on woody plant species. . . . . 1. **Plectrura** Mannh.

2 (1). Locomotory ampullae without ampullaceous granules. Tergite IX of abdomen without spinule. Anal pore transverse. In soil occupied by steppe herbaceous associations.

3 (4). Pronotum at anterior margin with very narrow white fringe that is markedly narrower than transverse pilose field. . . . . 2. **Dorcadion** Dalm.

4 (3). Pronotum at anterior margin with broad white fringe, that is not narrower or even broader than transverse pilose field. . . . . 3. **Eodorcadion** Breun.

Pupae

1 (2). Abdominal tergites with minute acute setigerous spinules. . . . . 1. **Plectrura** Mannh.

2 (1). Abdominal tergites without spinules, in posterior half with long dense bristles forming broad transverse band.

3 (4). Antennae slightly bent ventrad, their apices directed backward, flexed laterad. . . . . 2. **Dorcadion** Dalm.

4 (3). Antennae in second half arcuate, flexed ventrad, their apices directed forward. . . . . 3. **Eodorcadion** Breun.

1. Genus *Plectrura* Mannh.

Mannerheim, 1852. *Bull. Soc. Nat. Mosc.*, 25, 1: 365; *Phlyctidola* Bates, 1884. *Journ. Linn. Soc. Lond.*, 18: 236; Kojima and Hayashi, 1969. *Insects' Life in Japan*, 1: 113; Mamaev and Danilevskii, 1975. *Lichinki zhukov-drovodekov*, 225.

The genus *Plectrura* Mannh. comprises three species, of which one, *P. spinicauda* Mannh., belonging to the subgenus *Plectrura* s. str., is distributed in North America and two species, comprising the subgenus *Phlyctidola* Bat., live in eastern Asia, of which *P. mandshurica* Jac. occupies northeast China and *P. metallica* Bat., Pacific Ocean islands.

Type species: Plectrura spinicauda Mannerheim, 1852.

19 1. **Plectrura metallica** Bat.

Bates, 1884. *Journ. Linn. Soc. Lond., Zool.*, XVIII: 236;—*sachalinica* Jacobson, 1899. *Ezhegodn. zool. muz. AN SSSR*, 4: 43; Gressit, 1951. *Longic. Beetles of China*, 2: 329; Plavil'shchikov, 1958. *Fauna SSSR*, 23, pt. 1: 23–24; Kojima and Hayashi, 1969. *Insects' Life in Japan*, 1: 113; Krivolutskaya, 1973. *Entomofauna Kuril'skikh ostrovov*, 106.

Adult (Fig. 1): Body stocky, insignificantly elongate. Head perpendicular, beyond eyes barely tapering, with coarse punctation and adherent white hairs; medially, in region of frons, sinciput, and occiput, with deep longitudinal groove, with rounded, not projecting temples, with bold and compact punctation. Eyes narrow, sharply faceted, broadly emarginate or totally divided into two lobes; upper ocular lobe insignificantly smaller than lower. Antennae shorter, slightly longer (male) or barely shorter than body, flagelliform toward apex, with short compact adherent, not very dense gray hairs. First antennal segment tapering toward base; 2nd short, rounded, perceptibly wider than long; 3rd segment longer than 4th, distinctly longer than 5th.

Pronotum insignificantly less in length than in width at anterior margin, lateromedially with conical tubercle, tapering toward apex and base, laterally in anterior third with distinct interception, with coarse punctation, with minute adherent gray hairs not forming continuous pubescence, disk with three tubercular ampullae—one generally transversely elongate, situated in center beyond middle, two ampullae rounded, situated paramedially in front of middle. Pronotal shield short, transverse, broadly rounded posteriorly, with dense compact adherent gray hairs forming compact pubescence.

Elytra convex, tapering toward base and apex, in anterior third less, in posterior third more steeply sloping, apically with narrowly rounded

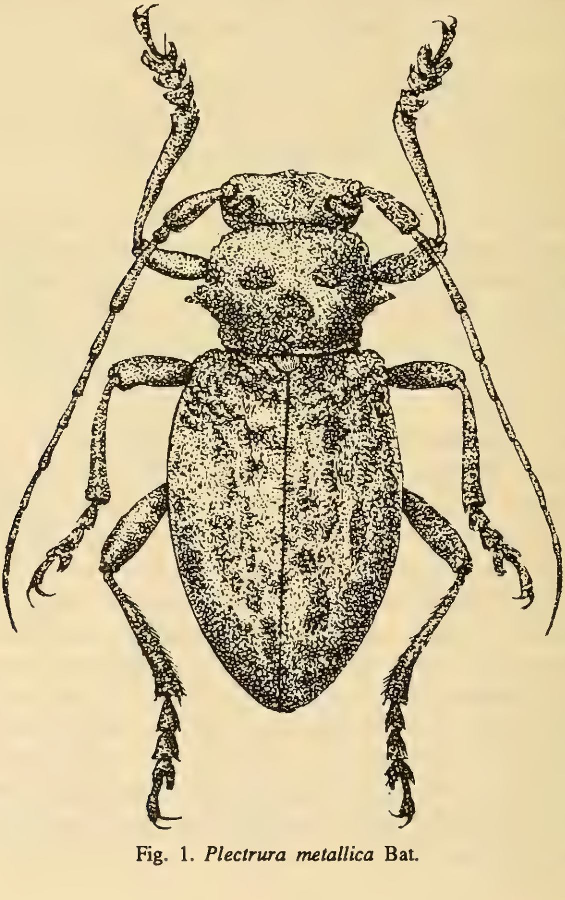


Fig. 1. *Plectrura metallica* Bat.

inner angle, with bold striate punctation, with smooth longitudinal ridges forming on each side of suture up to three–four distinct longitudinal rows, with adherent gray hairs forming characteristic longitudinally and transversely extended mottled pattern.

Body ventrally with adherent gray hairs, metasternum and abdominal sternites with fine, not very dense punctation. Sternite I basally with broad median projection extending anteriorly like a wedge, sternite V rounded 20 posteriorly, uniformly barely convex (male) or basally more convex, near posterior margin broadly compressed (female). Femora thick, uniformly tapering toward base. Hind tibiae slightly shorter than femora, on outer side more (male) or less (female) concave, with yellowish uniform bristles forming dense wavy crown apically on outer side. Hind tarsi considerably shorter than tibiae, with densely setigerous plantulae; 3rd tarsal segment incised almost up to base. Body, antennae, and legs rusty; elytra with brownish metallic tone. Body length 10–13 mm.

Egg: White, with yellowish-brown tone, elongate, slightly curved, at poles broadly, almost uniformly rounded, with fine matte sculpture. Length 2 mm, width 0.5 mm.

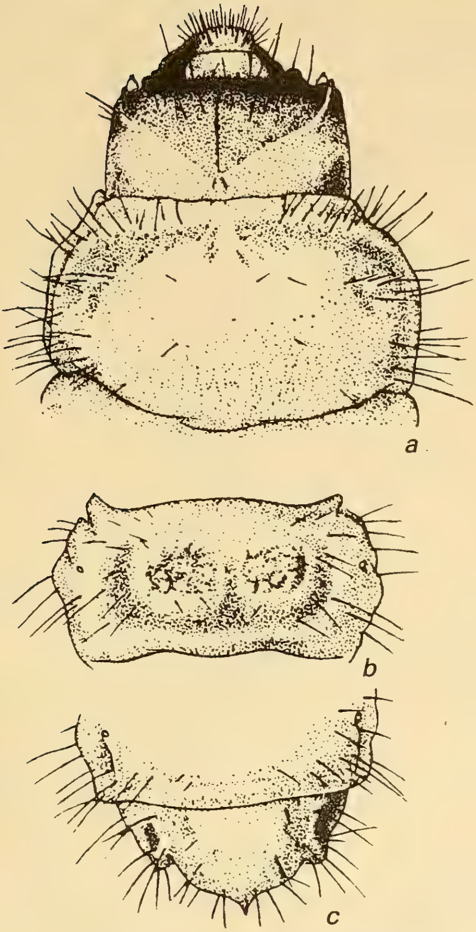
Larva (Fig. 2): Body elongate, white. Head parallel-sided, dorsoventrally distinctly flat, insignificantly retracted into prothorax. Epistoma triangular, rusty, at anterior margin with dark brown smooth fringe, laterally demarcated by whitish frontal sutures, medially divided by longitudinal groovelike brownish suture, at anterior margin and anteromedially with long bristles forming correspondingly one distinct transverse row each. Hypostoma rusty, moderately convex, laterally with straight sutures, with rounded anterior and produced acute posterior angles, in anterior half with 21 pair of thick bristles pushed toward gular band, divided medially by narrow whitish line. Temporo-parietal lobes (sides of head) rusty, at anterior margin with much darker fringe, in posterior half near frontal sutures whitish, with acutely produced lower anterior angles wedging between hypostoma and maxillae, in anterior half with individual setiform hairs in two transverse rows. Antennae short, barely projecting from antennal socket. Clypeus large, in anterior half and laterally hyaline, basally brownish. Labrum transversely oval, whitish, with dense rusty bristles, basally rusty-brown. Mandibles elongate, apically sloping, with more elongate lower and short triangular upper denticle, on inner side between these denticles triangularly punctate, with projecting ridges extending from lower denticle obliquely toward upper margin. Maxillae on outer side with long bristles in two transverse rows—one at base of cardo, the other at apex of palpiger. Laciniae comparatively thin, short, apically with long bristles. Maxillary palp three-segmented, brownish, only at anterior margin with whitish tinge, 3rd segment projecting forward beyond apex of laciniae. Labium parallel-sided, whitish, only on sides of labial palps with brownish tinge, on submentum with two wide-set and on mentum in front of middle with six–ten bristles forming interlacing transverse row.

Pronotum transverse, twice wider than long, slightly tapering or not tapering anteriorly, slightly sloping toward head, in anterior third and anteromedially with dispersed setiform hairs in two transverse rows. Pronotal shield white, laterally poorly demarcated, significantly convex, coriaceous, medially with barely perceptible, narrow longitudinal groove, disk with pair of short wide-set bristles laterally along longitudinal groove. Mesonotum medially with short setiform hairs forming transverse row. Metanotum with transverse groove dividing two rows of small granules. Prothoracic presternum moderately convex, disk in region of medial line glabrous, paramedially with long sparse hairs. Eusternum coriaceous, laterally with long rusty bristles, basally glabrous. Meso- and metasterna with two rows of oblique ampullaceous granules, in front of anterior row with pair of wide-set long bristles.

Abdomen elongate, laterally with long sparse rusty hairs, on segments I–VII with well-developed locomotory ampullae. Dorsal locomotory ampullae transversely ellipsoidly elongate, with three transverse rows of round ampullaceous granules. Ventral locomotory ampullae with two rows of oblique (elongate) granules. Abdominal tergite IX apically with acute spinules directed backward, disk convex, medially with four long setiform hairs in transverse row curved backward, subapical to caudal spinule with long thin setiform hairs. Body length 15–18 mm, width of head up to 2.5 mm.

Pupa (Fig. 3): Characterized by not very elongate, stocky body, location of bristles on pronotum and setigerous spinules on abdominal tergites. Head moderately projecting, between antennae flat, on occiput broadly rounded, smooth, near upper ocular lobes with two–three bristles, inner to lower ocular lobes with tubercular bulge bearing three large and two small bristles, near clypeus with six bristles in transverse row. Antennae 22 flexed laterad, in second half beyond midfemora annular on ventral side of body, their apices inclining toward body at level of anterior margin of stomatic apparatus.

Pronotum transverse, convex, smooth, lateromedially with large, conically extended tubercle, near anterior and posterior margins without interception, with long thin bristles forming two transverse bands (near apex and medially) and one extensive cluster paramedially on hind clivus. Lateral tubercles apically with long rusty bristles. Mesonotum insignificantly convex, posteriorly angularly rounded, at posterior margin with long, more or less dense bristles forming transverse band bent medially at an acute or even straight angle backward. Metanotum slightly convex, smooth, posteriorly directly truncate or medially slightly bent backward, in posterior



20 Fig. 2. Larva of *Plectrura metallica* Bat.

a—head and pronotum; b—abdominal tergite with dorsal locomotory ampulla; c—tip of abdomen with spinule at end of tergite IX.

half with thin bristles forming transverse row curved backward. Femora highly thickened apically, at apex on dorsal side with minute acicular bristles forming uniform transverse row at edge.

Abdomen comparatively thick, gradually tapering toward tip. Abdominal tergites in posterior half convex, sloping anteriorly, at posterior margin with short, acute, setigerous spinules with recurved apices forming uniform transverse row (sometimes these spinules on produced coriaceous base), near anterior margin with very minute bristles visible only under high

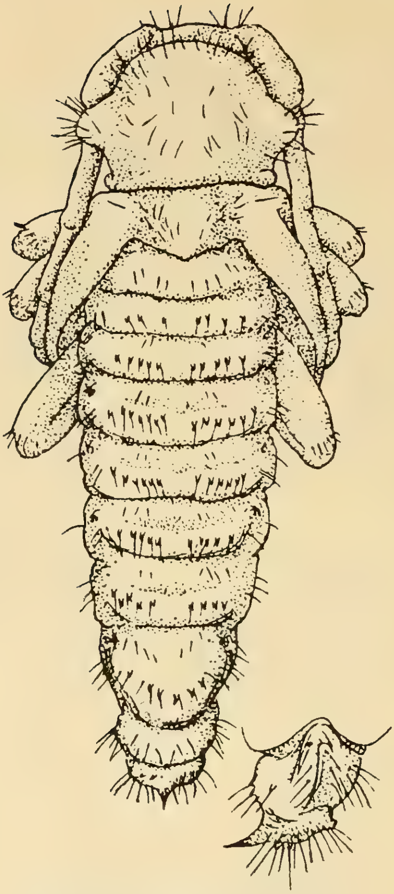


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Fig. 3. Pupa of *Plectrura metallica* Bat.

magnification. Abdominal tergite IX apically with upwardly produced urogomphus terminating in an acute sclerotized spinule. Tip of abdomen (in ventral view) obtuse, laterally bound by ridge covered with long dense (female) or sparse (male) rusty bristles located near base of small spinules. Valvifers of female small, slightly elongate, contiguous. Body length 10–13 mm, width of abdomen 4–5 mm.

Material: Specimens were collected on Kunashir and Sakhalin. Adults 79, larvae 114, pupae 44 males and females.

Distribution: Southern Sakhalin, Kuril Islands, Taiwan, Japan. We observed it in large numbers on Kunashir, in the environs of Sernovodsk and Alekhino.

Biology: Inhabits deciduous and mixed plantations. Ecologically associated with woody and bushy plant species. Beetles generally hibernate during winter in forest litter. They emerge from hibernation sites at May-end or in June. They lead a cryptic mode of life and do not appear on flowers. They crawl on stems and knots, on freshly felled trees and shoots of shrubs of different species. Here they mate and the females oviposit. The period of reproduction lasts (according to observations on Kunashir Island) from May-end to July inclusive. Using its mandibles, the female nibbles a cavity transverse to the stem in the bark (up to 2 mm long) and lays eggs in it. In a female caught in nature on July 2nd, 15 eggs were found in the ovaries. Females infest thick trees (8 cm or more diameter) as well as shoots of undergrowth (up to 0.6 cm diameter). Eggs are mainly laid in the underground zone of shoots.

Young larvae appear June-end or in July and only a few hatch at the beginning of August. The larva initially lives in the bark of shoots, then moves underneath it and makes longitudinal or transverse gallery impressed in the wood, and fills it with fine frass consisting only of bark or bark and partly wood. It bores into the wood of thin shoots (0.6–3.0 cm diameter) at an early stage, leaving an entry hole up to 2.5 mm long on the surface, and makes a longitudinal gallery in the heartwood. Larvae of the first year overwinter. By this time they weigh from 6 to 55 mg.
23 After hibernation the larvae continue to make galleries. Some larvae, especially those on thick stems, remain under the bark until pupation and most often by the last instar bore into the wood, plug the entry hole with coarse fibrous frass, make a cell longitudinal to the stem and pupate in it. Cells are found on thick-barked stems in and under the bark, on thin-barked stems in the wood. Length of gallery continuously made by a larva 15 cm, width before cell up to 5–7 mm. Length of pupal cell 15–21 mm, width 7–10 mm. Length of plug closing entry hole into cell made in the wood up to 8 mm.

Pupation of larvae begins during the first ten days of July and is completed in August. In 1974, we found the first pupae in the forest on July 7th and saw them thereafter up to August-end. Of the 24 pupae observed under natural field conditions, 3 (12.6%) were formed in the first half of June, 4 (16.6%) in the second half, 11 (45.8%) in the first half of August, and 6 (25.0%) in the second half. The pupal stage lasts up to three weeks. For example, from the pupae formed on July 20th, the beetles emerged on August 12th; in another case, a pupa developed from July 26th to August 13th; another pupa from August 1st to 22nd, and yet another from August 6th to 25th. Six pupae were under observation. The atmospheric temperature during this period fluctuated from 9°C in the morning to 32°C later in the day (average, 18.2 ± 0.5°C).

Emergence of beetles from pupae begins early August and is completed by August-end. In a field experiment in a shallow forest, 26 pupae were kept under observation, from which one beetle (3.8%) emerged during the first ten days of August, nineteen (73.1%) during the second decade, and six (23.1%) during the last ten days. In the same summer (mainly in August), young beetles nibble round openings (4–5 mm diameter) on the surface of shoots and exit the cell through them. They require supplementary feeding. After emergence from the wood, they crawl along shoots of the host plants and nibble the bark. Then toward winter they move into forest litter under the tree canopy and remain there until the commencement of warmth in the following year. Generation—two-year cycle. Larvae of mid-, rarely late instars and beetles hibernate during winter (Table 2). Based on 57 individuals, the weight of larvae before pupation was 50–165 mg (average, 100.3 ± 3.8), pupae 45–148 mg (average, 90.9 ± 3.4), beetles before emergence from cells 37.5–129 mg (average, 81.3 ± 3.0). During metamorphosis the weight of the insects reduced, on average, by 23.0%.

Plectrura metallica Bat. is found in large numbers on Kunashir Island and damages physiologically weakened, drying as well as freshly felled (windfelled) trees and bushes of deciduous and coniferous species. We raised 72 beetles in fields from larvae collected from the forest, which included 18 on alder, 9 willow, 5 each maple, oak, and bird cherry, 4 each magnolia and spruce (*Picea microsperma*), 3 rowan berry, 2 each dimorphant (*Kaloponax septemlobum*), birch, rhododendron (*Rhododendron tschonoskii*), viburnum, and currant bush, 1 each grapevine (*Vitis kaempferi*) and carpeting bush (*Pinus pumila*), and 5 on other plant species.

24 Almost similar material was obtained by us during forest inspections in the environs of Mendeleevo, Sernovodsk, and Alekhino (Kunashir Island). Larvae, pupae, and beetles were collected: 46 specimens from rowan berry, 39 alder, 28 willow, 13 bird cherry, 10 fir, 6 spruce, 5 maple, 4 oak, 2 elm, 2 birch, and 1 each grapevine, currant bush, Amur cork tree, magnolia, and cedar.

Plectrura metallica Bat. ascends mountains upto 700–800 m or more. We found it near the Golovnin volcano at the top of the mountain.

Table 2. Development of *Plectrura metallica* Bat.

Year of development	May	June	July	August	September	October
1st	A	AEL	AEL	AEL	EL	L
2nd	L	L	LP	PA	A	A
3rd	A	AEL	AEL	AEL	EL	L

Note: Here and in Table Nos. 3, 6, 8, and 10–17: A—adult, E—egg, L—larva, P—pupa.

2. Genus *Dorcadion* Dalm.

Dalman, 1817. In Schönch: *Syn. Ins.*, 3: 397; Gressit, 1951. *Longic. Beetles of China*, 2: 330 (typ. *Lamia glycyrrhizae* Fabr., 1781); Plavil'shchikov, 1958. *Fauna SSSR*, 23, pt. 1: 31–93; Kostin, 1973. *Zhuki-dendrofagi Kazakhstana*, 210.

Adult: Characterized by longitudinal ridges and white or yellowish-cream pilose bands on elytra and absence of sclerite between clypeus and labrum. Head with insignificantly laterally deflected antennal tubercles, with narrow median longitudinal groove, between clypeus and labrum without additional sclerite. Antennae shorter than body, extending up to middle of elytra (female) or notably beyond it (male). Pronotum transverse, square or barely oblong, laterally with acutely produced tubercle. Elytra oval, toward base less, toward apex more tapering, apically individually rounded, with longitudinal ridges, of which humeral ridge more and middle and inner ridges less distinct, with continuous pubescence against which white longitudinal bands (*D. cephalotes* Jak. and others) are distinguishable, or glabrous with only longitudinal white or creamy-yellow pilose bands (*D. politum* Dalm.). Membranous wings underdeveloped.

Larva: Body thick. Head highly retracted into prothorax. Epistoma throughout length divided by median longitudinal suture (sutura medialis), laterally fusing with temporo-parietal lobes. Frontal sutures not perceptible. Hypostoma short, four times wider than long. Pronotum at anterior margin with dense rusty hairs forming an extensive field or broad transverse band. Pronotal shield white, coriaceous, not sclerotized. Eusternum convex, well demarcated by groove. Thoracic legs absent. Abdomen weakly elongate, thick, tapering from thorax toward tip. Dorsal locomotory ampullae coriaceous, not sclerotized, sometimes coarsely striated (*D. cephalotes* Jak.), divided by two deep transverse grooves uniting with each other laterally, forming transversely elongate ridge, anterior and posterior folds. Ventral locomotory ampullae divided medially by deep transverse groove, from which extend anteriorly and posteriorly short striae directed inward. Anal pore transverse.

Pupa: Body broad. Head with wide-set antennal tubercles, medially with longitudinal troughlike groove, frontally with acicular bristles. Labrum laterally with dense rusty bristles. Antennae short, flexed laterad on body, their apices directed backward or bent ventrad. Pronotum laterally with large produced tubercle and dispersed acicular bristles. Abdomen highly enlarged, tapering toward base and tip. Abdominal tergites in posterior half convex, medially with longitudinal groove, paramedially with dense rusty bristles forming broad transverse band. Tergite VII elongate, apically rounded, disk convex, with several bristles in transverse row or rarefied

band beyond middle. Tip of abdomen triangularly obtuse, laterally bound by
25 setigerous ridge, dorsally with produced urogomphus.

In the Soviet Union, 138 species of the genus *Dorcadion* Dalm. are known, of which not less than three species close to the fauna of southern Kazakhstan are found in northern Asia. It must be mentioned that the taxonomy of the genus *Dorcadion* Dalm. is not well worked out. A much wider analysis on a sound ecological basis is needed. All the species of the genus *Dorcadion* Dalm. are ecologically associated with herbaceous plants, sporadically found within the limits of their distribution range (at localized stations), and live in individual colonies occupying open steppe biotypes. Each colony, in fact, represents a distinct population developing in isolation from other populations. Such isolation facilitates ''progressively rapid'' differentiation of fauna and creates favorable conditions for much ''faster'' speciation; this ultimately was the cause of the historically evolved polymorphism of this genus as a whole.

Type species: *Cerambyx glycyrrhizae* Pallas, 1774.

KEY TO SPECIES

Adults

1 (4). Marginal white band basally on elytra (below humeral tubercle) without large deep punctures; antennae without tender pubescence, only outer side of 1st segment with coarse bristles. Length of body more than 15 mm (*Dorcadion* s. str.).

2 (3). Pronotum and elytra glabrous, only with longitudinal white pilose bands. Humeral white longitudinal band on elytra narrow, uniform, along margins not serrate; spinal band continuous, distinct, only sometimes reduced. . . . . 1. **D. politum** Dalm.

3 (2). Pronotum and elytra with continuous compact adherent velvety pubescence. Humeral white longitudinal band on elytra broad, along margins serrate; spinal band discontinuous, comprising individual specks. . . . . 2. **D. cephalotes** Jak.

4 (1). Marginal white band basally on elytra (below humeral tubercle) with large deep punctures; antennae basally with dense tender adherent pubescence (*Autodorcadion* Plav.). Length of body up to 12 mm. . . . . 3. **D. elegans** Kr.

Larvae

1 (4). Epistoma at anterior margin along sides of longitudinal suture with rounded projection. Pronotum in anterior half with dense

rusty hairs. Body length of last instar larvae more than 22 mm.

2 (3). Pronotal shield with solitary hairs not forming perceptible clusters. Anal segment of abdomen sparsely pilose, basally and laterally glabrous. . . . . 1. **D. politum** Dalm.

3 (2). Pronotal shield with numerous hairs forming distinct dense cluster laterally, close to longitudinal grooves. Anal segment of abdomen densely pilose, basally and laterally with short hairs. . . . . 2. **D. cephalotes** Jak.

4 (1). Epistoma at anterior margin along sides of longitudinal suture without projection, directly truncate. Pronotum in anterior half with sparse bright, barely perceptible hairs. Body length of last instar larvae up to 14 mm. . . . . 3. **D. elegans** Kr.

26 **Pupae**

1 (4). First abdominal tergite with dense rusty bristles forming transverse band in posterior half. Urogomphus terminally without sclerotized spinule.

2 (3). Pronotum on disk with solitary bristles not forming median transverse band. . . . . 1. **D. politum** Dalm.

3 (2). Pronotum on disk with numerous bristles forming distinct median transverse band. . . . . 2. **D. cephalotes** Jak.

4 (1). First abdominal tergite glabrous, with only four bristles forming transverse row. Urogomphus terminally with acute sclerotized spinule. . . . . 3. **D. elegans** Kr.

1. **Dorcadion politum** Dalm.

Dalman, 1823. *Ann. Ent.*, 68; Plavil'shchikov, 1958. *Fauna SSSR*, 23, pt. 1: 322–326; Kostin, 1973. *Zhuki-dendrofagi Kazakhstana*, 213; Cherepanova, 1980. *Sistematika i ekolog. zhivotnyk* (*novye i maloizv. vidy fauny Sibiri*), 93–94.

Adult (Fig. 4): Body elongate, narrow (male) or broad and more convex (female). Head with narrow median longitudinal groove passing over to occiput, rarely glabrous, more often with short adherent white hairs forming triangular spot in front of lower ocular lobe, three narrow longitudinal bands in posterior half, and one narrow or broad longitudinal band in anterior half. All these bands fuse at level of antennal tubercles. Frons lustrous, with minute evanescent punctation. Antennal tubercles moderately produced, wide-set. Sinciput and occiput with uneven, temples and genae with coarse punctation. Eyes slightly convex, broadly emarginate, very finely faceted. Antennae shorter than body, basally thick, toward apex thin, smooth, glabrous, lustrous, only at distal margin of segments with short dark brown bristles. First antennal segment thick, outer side with coarse punctation and short rusty-brown bristles.

Pronotum transverse (female) or length barely greater than width at posterior margin, toward base more, toward apex less tapering, laterally closer to anterior margin with spiniform, acutely produced tubercle, disk convex, medially with troughlike longitudinal groove, lustrous, with minute, barely perceptible, at posterior margin with large solitary punctures or without them, at base of lateral tubercles medially (in region of longitudinal groove) with dense compact adherent white (sometimes with yellowish tinge) hairs, on sides behind lateral tubercles with deep setigerous pores. Pronotal shield very small, triangular, posteriorly narrowly rounded, with adherent white hairs.

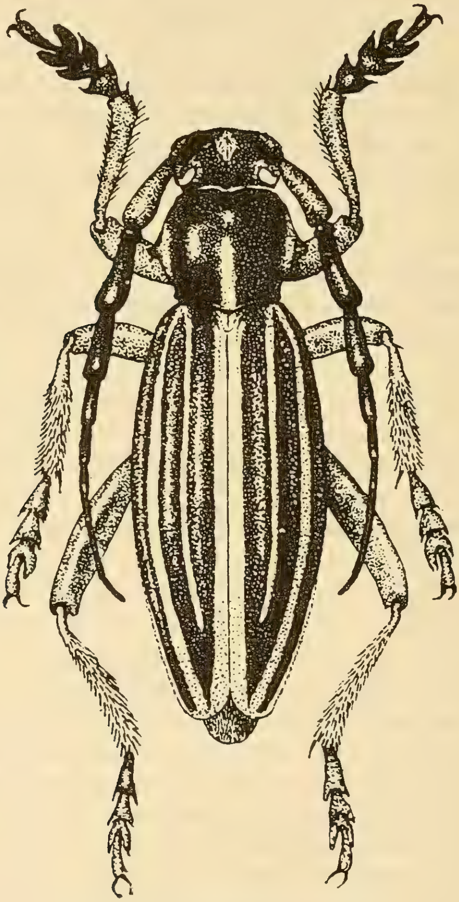

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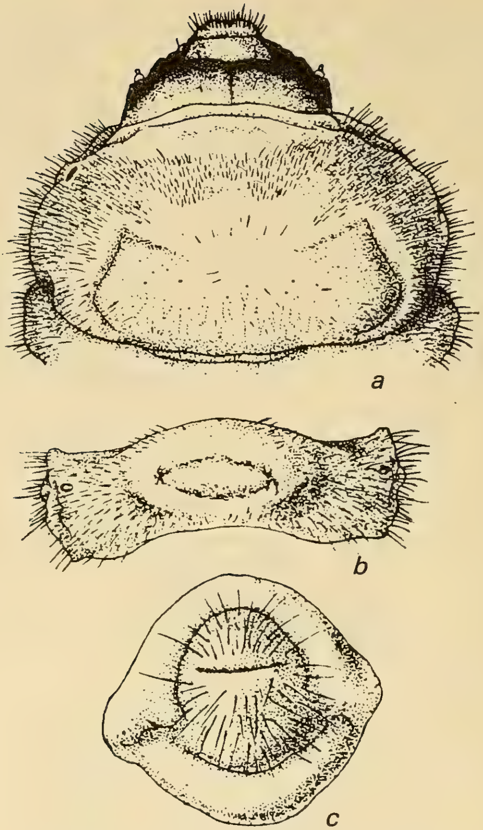
Fig. 4. *Dorcadion politum* Dalm.

Elytra more (male) or less (female) elongate, ellipsoid, medially in males less, in females more expanded, apically individually rounded, disk convex, with three longitudinal ridges (one outer or humeral ridge more extended, at base serrate; middle ridge well and inner ridge less distinct), with four longitudinal densely pilose bands, of which sutural band extends from base to apex and here unites with humeral and marginal bands extending from apex to base. Between humeral and sutural bands lies short narrow spinal band extending from base to hind clivus (f. typica), sometimes here uniting with sutural (ad. *altinbajevi* Plav.) or with humeral band (ad. *conjunctum* Pic), or is so reduced that it terminates in the first half before
27 the middle (ab. *dorsoinfensum* Plav.). Legs not very long. Hind femora extending up to hind clivus of elytra. Tibial brushes consist of dense golden bristles. Ventral side of body with tender gray, not very dense adherent hairs, which are often absent on disk of abdomen; as a result, abdomen appears medially glabrous. Abdominal sternite V on disk smooth, apically with coarse punctures, here obtuse, laterally with coarse brownish bristles (female) or broadly emarginate, without bristles (male). Body black. Antennae black, apically rusty-brown. Femora black, basally sometimes rusty, tibiae and tarsi rusty, sometimes tarsi dark or legs and 1st antennal segment entirely red. Body length 15–21 mm.

Egg: White, becoming yellowish-brown with time, elongate, toward caudal pole slightly tapering, at poles gently rounded. Chorion with very fine sculpture imparting matte appearance. Length 4 mm, width 1.5 mm.

Larva (Fig. 5): Body thick, white with yellowish tinge. Head highly retracted into prothorax. Epistoma slightly convex, medially divided throughout length by sharp longitudinal suture, in anterior half rusty-red, here with six bristles (three on each side of suture) forming transverse row, at anterior margin dark brown, with anteriorly extended projections (one projection on each side of suture), with insignificantly produced anterior angles, in posterior half whitish, fusing with temporo-parietal lobes.
28 Frontal sutures not perceptible. Hypostoma reddish-rust, slightly convex, anterior margin broadly rounded, posterior margin emarginate, with perceptible transverse striae, anterior angles roundly (gently) sloping, four–five times wider than long. Temporo-parietal lobes in anterior half rusty or rusty-brown, in posterior half whitish with yellowish tinge. Antennae conical, whitish with yellowish tinge. Ocelli small, ampullar, bright brown. Clypeus trapezoid, convex, four times wider than long, with whitish hue. Labrum transverse, anterior margin truncate, in anterior half with dense rusty bristles, basally with rusty tone. Mandibles black, apically obliquely incised, on inner side with distinct ridge extending from ventral denticle to middle of dorsal margin.

Pronotum transverse, twice wider than long, in anterior third with



27 Fig. 5. Larva of *Dorcadion politum* Dalm.

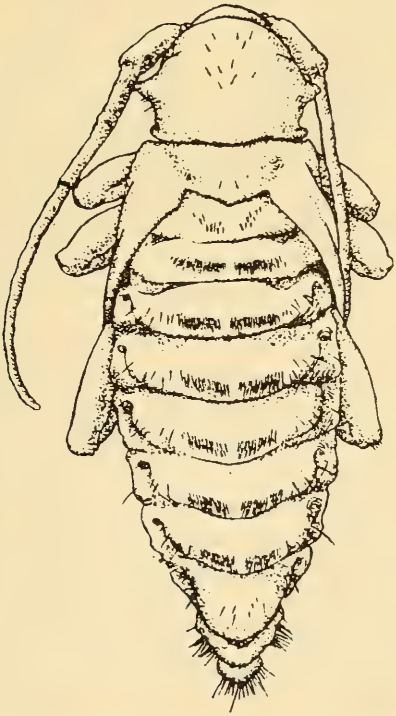
a—head and pronotum; b—abdominal tergite with dorsal locomotory ampulla; c—tip of abdomen (posterior view).

short dense bright rust hairs forming broad transverse band, laterally with thin, not very dense hairs. Pronotal shield white, coriaceous, not sclerotized, moderately convex, with short striae, laterally demarcated by deep longitudinal grooves uniting anteriorly with transverse notches demarcating anterior angles of shield. Prothoracic presternum with short thin rusty hairs; eusternum convex, well demarcated by groove, disk with short rusty hairs; posterior basal part of prosternum (basisternum s. sternellum) glabrous, smooth, only laterally with short hairs.

Abdomen thick, gradually tapering from thorax toward tip, laterally with short dense rusty hairs. Dorsal locomotory ampullae coriaceous, not sclerotized, convex, divided by deep transverse grooves uniting laterally and demarcating transversely elongate ridge, medially with barely perceptible longitudinal groove. Ventral locomotory ampullae divided by transverse groove, with short oblique striae demarcating faint granules in two transverse rows. Tip of abdomen with long rusty hairs. Body length of late instar larvae 22–28 mm, width of head 3.8–4.0 mm.

Pupa (Fig. 6): Body massive. Head between antennae with longitudinal troughlike groove, frontally with acicular bristles forming cluster inner to antennae, transversely extended cluster before anterior margin, and transverse row before base of clypeus. Labrum at anterior margin broadly rounded, with dense rusty bristles, only basally and on narrow portion in middle glabrous. Mandibles with pair of adjacent bristles. Antennae short, flexed laterad, their apices extending up to tergite III (female) or almost up to tergite V (male).

29 Pronotum not longer (male) or shorter (female) than basal width, laterally with produced conical tubercle, disk convex, medially with longitudinal groove, with solitary rusty bristles dispersed almost throughout surface and forming small cluster behind lateral tubercles. Mesonotum



28 Fig. 6. Pupa of *Dorcadion politum* Dalm.

almost flat, posterior margin slightly produced angularly, with three–five lateral bristles along posterior margin. Metanotum trapezoid, short, slightly convex, medially with longitudinal, transversely flaring groove, in posterior half with rusty bristles laterally, which form transversely elongate cluster.

Abdomen in region of segment III enlarged, tapering toward base and tip. Abdominal tergites I–VI in posterior half convex, here with dense rusty, backwardly directed bristles forming broad transverse band interrupted medially by deep longitudinal groove. Tergite VII elongate, triangular, posteriorly rounded, disk convex, beyond middle with a few bristles forming transverse band. Tergite VIII convex, ridgelike, almost semicircular, with barely perceptible, solitary bright bristles forming transverse row, or without them. Tip of abdomen obtuse, bound (in ventral view) by triangular ridge covered with dense rusty bristles. Urogomphus barely perceptible, without sclerotized spinule. Valvifers of female small, hemispherical, contiguous. Body length 17–23 mm, width of abdomen 7–9 mm.

Material: Collected in Kulunda and northern Kazakhstan. Adults 12, larvae 44, pupae 6 males and 3 females, exuviae of larvae and pupae 6.

Distribution: Southern Urals, northern Kazakhstan, Kulunda, north western foothills of Altai.

Biology: Inhabits areas of open steppe zone. Found in individual colonies on slopes of small hillocks and on virgin fields in plains covered with cereal grasses, among which the dominant were *Stipa lessingiana*, *Festuca valesiaca*, *Psathyrostachys juncea*, and others. Beetles appear on the soil surface in April and are found up to mid-June. They feed on green tissues of leaves. During this period their gonads mature and they then mate. Females lay one egg in the axil of leaves arising from the underground part of stems. Feather grass, fescue, and other cereal grasses are infested.

Larvae of the first instar live in the rhizome and feed on its tissues. Larvae of mid- and late instars make galleries in the sod, partially penetrate hard layers of the soil, and are found up to a depth of 14 cm. They nibble roots and stems and sometimes damage leaves lying on the soil surface. Galleries made by larvae in the soil are packed with a grayish or greenish mass consisting of excreta but sometimes are hollow and look like small niches or polished tunnels. Larvae hibernate twice. After the second hibernation, the larva makes a pupal cell in the soil and pupates in it in the latter half of summer. Length of cell 3–4 cm, width 1.3–1.5 cm. The 30 cells are vertical or slope toward the soil surface and are laid at a depth up to 12 cm. Larvae pupate in the cells with their head upward. In 1978, pupation of larvae began on July 22nd and in 1981, on July 19th, and was completed by the middle (second ten days) of August. The pupal

29 **Table 3. Development of *Dorcadion politum* Dalm.**

Year	April	May	June	July	August	September
1st	A	AE	AE	EL	EL	L
2nd	L	L	L	L	L	L
3rd	L	L	LP	LPA	PA	A
4th	A	AE	AE	EL	EL	L

Table 4. Weight indices (mg) of *Dorcadion politum* Dalm. during metamorphosis

Sex	No. of insects	Larvae before pupation		Pupae		Adults	
		Min.	Max.	Min.	Max.	Min.	Max.
Male	9	406	528	353	487	250	380
Female	6	505	642	422	571	290	426

stage lasts, on average, up to three weeks. For example, at a soil temperature of 19–25°C, a beetle emerged after 20 days and another after 24 days of pupation.

Emergence of beetles begins in late July and is completed by August-end or early September. In 1978, on July 31st, 22 specimens were removed from the soil, which included one beetle, four pupae, and seventeen larvae of last (before pupation) and mid-instars. Beetles overwinter in pupal cells and emerge from the soil with the onset of warmth the following spring. Generation—three-year cycle (Table 3).

During metamorphosis the insects collected lost from 39.7 to 45.6% of their weight. Maximum weight loss (from 23.3 to 32.9%) was observed during development of adult from the pupa. Weight indices of the insects reveal a significant range of variation (Table 4). The average weights of the males were: larvae before pupation 465.8 mg (± 13.1), pupae 393.7 mg (± 13.6), beetles before emergence from cell 288.2 mg (± 13.4). The corresponding weights of females were: 574.0 mg (± 30.6), 505.7 mg (± 28.7), and 355.5 mg (± 19.9).

2. **Dorcadion cephalotes** Jak.

Jakovlev, 1890. *Horae Soc. Ent. Ross.*, 24: 252;—*turgaicum* Suvorov, 1915. *Russk. entomol. obozr.*, 15: 121; —*akmolicum* Suvorov, 1915. *Ibid.*, 121: 121; Plavil'shchikov, 1958. *Fauna SSSR*, 23: 340–342; Kostin, 1973. *Zhukidendrofagi Kazakhstana*, 214.

Adult (Fig. 7): Characterized by pronotum and elytra with minute dark brown pubescence forming dark velvety background, against which longitudinal white bands are distinct. Body moderately elongate, oval, in females more enlarged. Head large, medially with narrow deep longitudinal band extending from anterior third of frons to posterior margin of occiput. Frons matte, with sparse deep punctures, between antennae with broad whitish-yellow pilose spot bearing two black longitudinal bands. Sinciput with dark velvety pubescence, medially with narrow dotted longitudinal white pilose band. Eyes weakly convex, broadly emarginate, finely faceted, on upper and lower sides fringed with whitish pubescence. Antennae thick, highly tapering toward apex, extending up to posterior fourth of elytra (male) or barely extending beyond their middle (female).

Pronotum barely longer (male) or not longer (female) than its basal width, laterally with spiniform, acutely produced tubercle, with fine black velvety pubescence, medially with narrow longitudinal white pilose band, with broad white fringe laterally, on hind clivus of lateral tubercles with sparse large black punctures. Pronotal shield triangular, highly elongate,
31 entirely covered with fine adherent white pubescence.

Elytra oval, elongate, apically individually broadly rounded, toward apex more, toward base less tapering, with fine black or dark brown velvety pubescence, with longitudinal white pilose bands, of which marginal (comparatively narrow) and humeral (broad) bands extend from humerus to apex of elytra; spinal band very narrow, reduced, generally discontinuous, sutural band narrow, not discontinuous, distinct (f. typica). Humeral band along margin often perceptibly serrate (ab. *alexii* Suv.). Ventral side of body with fine compact adherent grayish pubescence. Body and antennae black. Femora and tarsi black, tibiae reddish-rust, apically much darker. Body length 19–24 mm.

Egg: White with brownish tinge, elongate, poles gently rounded, tapering gradually toward caudal pole. Chorion matte, without perceptible sculpture. Length 7.5 mm, width 2.0 mm.

Larva (Fig. 8): Distinguished from *Dorcadion politum* Dalm. by presence of numerous setiform hairs on pronotal shield, dense pubescence on anal segment of abdomen and distinct striae on locomotory ampullae.
32 Body with yellowish tone. Head highly retracted into prothorax. Epistoma reddish-rust, at anterior margin dark brown, with two broadly rounded projections (therefore, medially appears narrowly emarginate here), with distinct medial suture. Frontal sutures not perceptible. Hypostoma rusty or dark brown, with more perceptible, broadly emarginate anterior margin. Temporo-parietal lobes dark rust, at anterior margin almost black, in

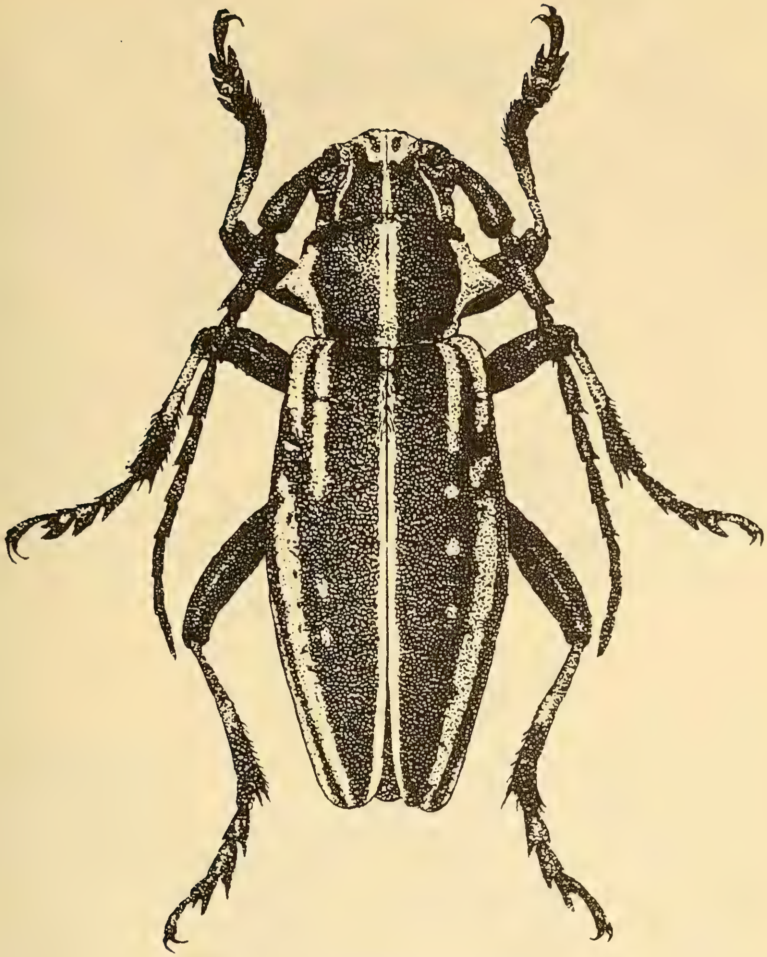


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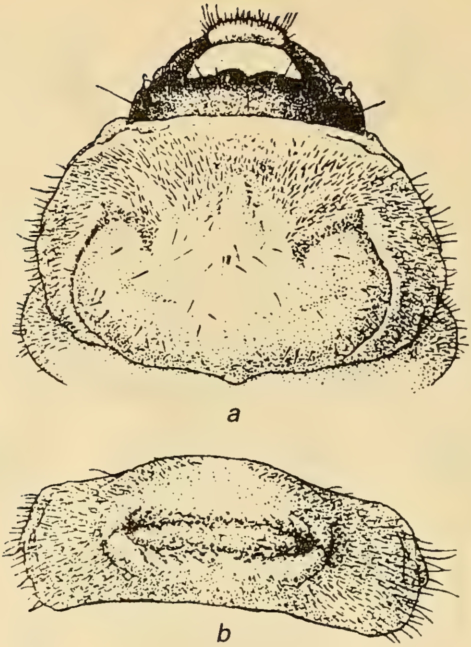
Fig. 7. *Dorcadion cephalotes* Jak.

anterior half with short solitary hairs. Antennae very short, barely projecting from antennal sockets. Clypeus broad, trapezoid, rusty-brown. Labrum transverse, anterior margin broadly rounded, with short dense rusty bristles, only basally glabrous. Mandibles massive, moderately elongate, blackish-brown, apically slanting steeply.

Pronotum roundly tapering anteriorly, laterally and on disk in front of shield with dense rusty hairs, in anterior half with narrow glabrous band extending from anterior angles obliquely backward toward medial line. Pronotal shield white, coriaceous, not sclerotized; laterally demarcated by deep longitudinal, laterally extending furrows uniting anteriorly



32 Fig. 8. Larva of *Dorcadion cephalotes* Jak.

a—head and pronotum; b—abdominal tergite with dorsal locomotory ampulla.

with transverse, backwardly directed notches. Latter form small depression at anterior margin of shield inner to anterior angles, with short setiform hairs forming small cluster near lateral grooves. Presternum and eusternum with short uniform rusty hairs. Base of prosternum (basisternum s. sternellum) glabrous, only laterally with short dense hairs.

Abdomen thick, laterally with uniform minute rusty hairs. Locomotory ampullae coriaceous, coarsely or barely perceptibly striate, on ventral side divided by one, on dorsal side by two transverse grooves uniting laterally and demarcating transverse ridge. Lateral longitudinal grooves very short,
33 outcurved. Segment X (anal) short, hemispherical, with uniform dense coarse setiform hairs. Body length up to 35 mm, width of head 5–6 mm.

Pupa (Fig. 9): Similar to pupa of *Dorcadion politum* Dalm. Distinguished from it by much larger size of body, location of bristles on pronotum, and other characters. Body large. Head broad, frontally flat, medially with narrow longitudinal groove, with barely raised antennal tubercles, inner to them with coarse bristles forming one rarefied cluster on each side of longitudinal groove. Labrum apically with dense bristles. Antennae flexed laterad, beyond midfemora their apices slightly curved ventrad.

Pronotum almost square, laterally with large produced tubercle, disk convex, medially with narrow, barely perceptible longitudinal groove, with short bristles forming medially more or less distinct transverse band. Mesonotum beyond middle with transverse groove, at posterior margin with barely raised shield, with short bristles forming one elongate cluster on both sides. Metanotum short, posteriorly almost directly truncate, medially with longitudinal groove, lateral to groove with numerous bristles forming transversely elongate cluster.

Abdomen in region of segments III–IV enlarged. Abdominal tergites I–VI in posterior half convex, gradually transversely compressed anteriorly, medially with deep longitudinal groove which laterally (on convexities) bears long dense rusty bristles directed backward. Tergite VII apically rounded, disk convex, with two–four bristles in transverse row medially. Tergite VIII transverse, convex, lustrous, without bristles. Tip of abdomen (in ventral view) triangularly obtuse, laterally bound by ridge covered with dense bristles. Urogomphus at tip of abdomen produced, acute, not sclerotized. Valvifers of female small, slightly elongate, contiguous. Body length 23–29 mm, width of abdomen 8–12 mm.

Material: Collected in northern Kazakhstan (Karaganda, Nura River,

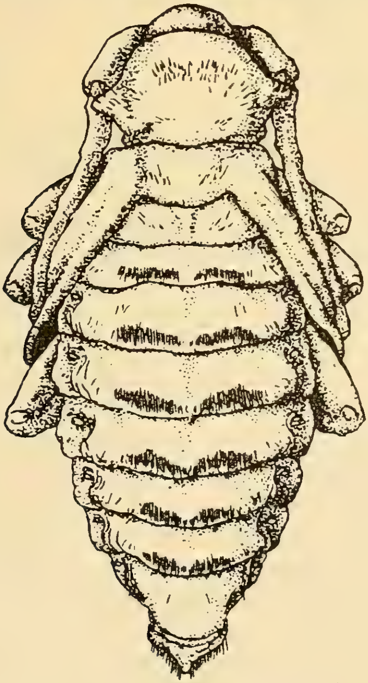


Fig. 9. Pupa of *Dorcadion cephalotes* Jak.

Tselinograd). Adults five, larvae two, pupae three females, exuviae of larvae and pupae with beetles from cells two.

Distribution: Eastern regions of Kazakhstan from Semipalatinsk, Tselinograd, Karaganda in the north up to the Chu River and Lake Balkhash in the south.

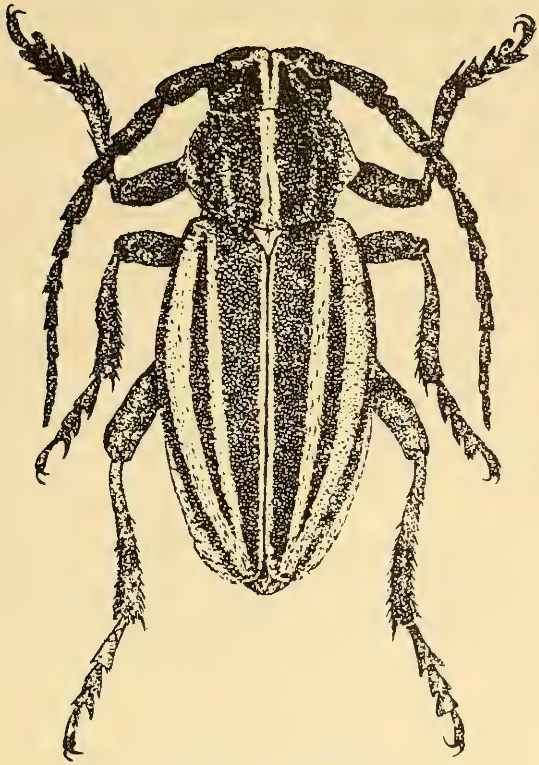
Biology: Inhabits steppe fields with sparse vegetative cover, in which cereal grasses predominate—*Stipa* sp., *Festuca* sp., *Plathyrostachys* sp., and others—comprising up to 30–50% of the cover. Breeding period confined to first half of summer. Beetles crawl mostly in May and June. Eggs are laid in the basal zone of grass stems. Larvae live in the soil and, in making galleries, pierce the boundaries of the root system of the grass cover. They live up to two years. In the last instar, they make a cell and pupate in it. Pupal cells are made in the soil at a depth of 9–10 cm and are generally vertical. Pupae lie in them with their head upward. Length of cell up to 44 mm, width up to 20 mm. Pupation at June end or in July. Beetles emerge in July, overwinter in the cells, and exit from them in spring with the onset of warmth. Weight of larvae before pupation 738–1,097 mg, pupae 675–998, beetles 614–741 mg. Generation—three-year cycle. *Dorcadion cephalotes* Jak. is rather rare and occurs in small colonies. Larvae feed on tissues of the roots of herbaceous plants (mostly cereal grasses).

34 3. **Dorcadion elegans** Kr.

Kraatz, 1873. In Küster: *Kät. Eur.*, 29: 73; Plavil'shchikov, 1958. *Fauna SSSR*, 23, pt. 1: 158–160; Kostin, 1973. *Zhuki-dendrofagi Kazakhstana*, 211.

Adult (Fig. 10): Well distinguished from other species by pubescence on antennae and coarse (deep) punctation of perihumeral (curved) part of elytra. Body oval. Head not broader than pronotum, medially with deep longitudinal groove extending from anterior margin of frons to posterior edge of occiput, with dense gray adherent hairs, on sides of frons (inner to antennae) and occiput with triangular, longitudinally produced, black pilose spots divided medially by longitudinal white pilose band. Eyes weakly convex, finely faceted, broadly emarginate. Antennae thick, highly tapering toward apex, extending beyond three-fourths of elytra (male) or beyond their middle (female), basally with dense pubescence.

Pronotum transverse, laterally with large spiniform, acutely produced tubercle, disk convex, with dense adherent black pubescence, medially with narrow longitudinal white pilose band divided in some individuals longitudinally by a black (dotted) line, at base of tubercles with bright hairs forming broad indistinct band. Pronotal shield elongate, triangular, apically acute, with dense gray pubescence.



34 Fig. 10. *Dorcadion elegans* Kr.

Elytra oval, disk convex, markedly tapering toward base and apex, at apex individually rounded, with dense compact adherent black or dark brown pubescence, in produced part basally with large deep punctures, with longitudinal white pilose bands, of which lateral and humeral bands broad, spinal band narrow, uniting basally and apically with humeral band; sutural band narrow, distinct. Body ventrally with dense compact adherent gray pubescence. Abdominal sternite V slightly convex, posterior margin broadly emarginate (male) or highly convex, apically perceptibly compressed (female), lateral to this depression with long bristles. Body and antennae black, legs dark brown with rusty tinge. Body length 9–10 mm.

Larva (Fig. 11): Body white. Head parallel-sided, moderately retracted into prothorax. Epistoma rusty, anterior margin directly truncate and with dark brown (almost black) fringe, medially divided by distinct longitudinal
35 suture, apically deeply incised, laterally fusing with temporo-parietal lobes; frontal sutures not perceptible. Hypostoma convex, lustrous, parallel-sided, anterior and posterior margins almost directly truncate, transverse, length

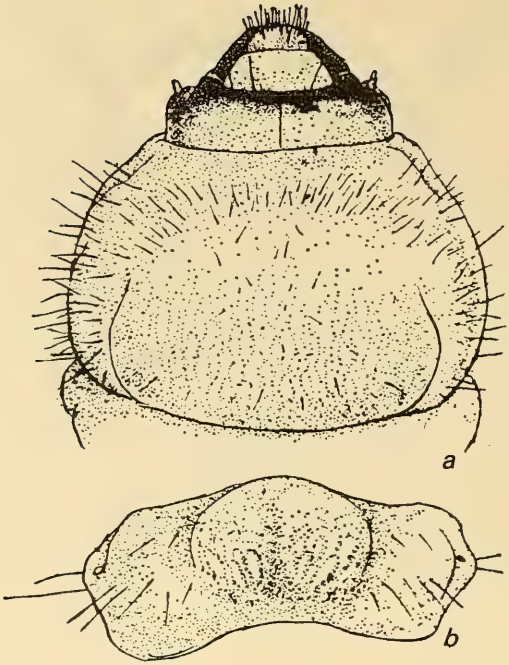


Fig. 11. Larva of *Dorcadion elegans* Kr.
a—head and pronotum; b—abdominal tergite with dorsal locomotory ampulla.

one-fourth width. Temporo-parietal lobes at anterior margin with broad lustrous rusty fringe covering ocular-antennal zone. Antennae thin, their apices barely projecting beyond anterior margin of head capsule. Clypeus broad, trapezoid, brownish. Labrum transverse, apically broadly rounded, in anterior half with rusty bristles. Mandibles dark rust, apically black, here obliquely truncate, with acute ventral and obtuse dorsal denticle.

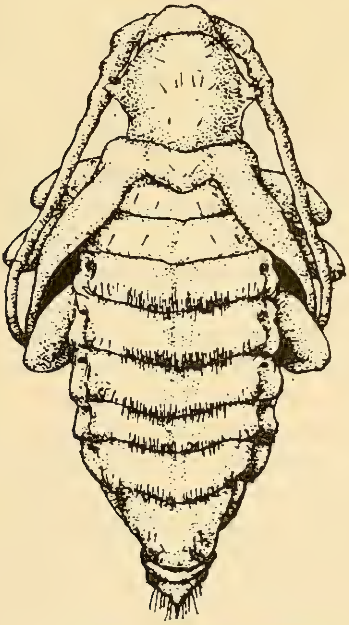
Pronotum insignificantly tapering anteriorly, laterally and in anterior half with sparse bright rusty hairs. Pronotal shield white, coriaceous, not sclerotized, laterally demarcated by short longitudinal faint grooves, without hairs, with minute striae. Presternum and eusternum coarsely striate, with sparse bright hairs.

Abdomen insignificantly tapering posteriorly, laterally with sparse short hairs. Dorsal locomotory ampullae moderately convex, medially divided by common longitudinal groove, two grooves converging transversely on sides and demarcating transverse ridge. Ventral locomotory ampullae slightly convex, perceptibly striate. Segment X (anal) of abdomen broadly rounded, with sparse long hairs. Body length of last instar larvae 13–14 mm, width of head 1.5 mm.

Pupa (Fig. 12): Distinguished from larvae of preceding species by smaller body size, absence of dense bristles on abdominal tergite I, and presence of sclerotized spinule at apex of urogomphus. Body short, thick. Head short, medially with broad longitudinal trough, at anterior margin
36 with acicular bristles forming paramedial cluster (with up to seven bristles) on each side, inner to antennal tubercles with three–four and behind them with two bristles. Antennae flexed laterad, their apices slightly bent ventrad. Labrum convex on disk, apically broadly rounded, laterally with long bristles.

Pronotum transverse or slightly oblong, laterally with triangularly extended large tubercle, medially with longitudinal groove, with solitary bristles, only at base of lateral tubercles with three–seven bristles, forming here a small cluster. Mesonotum convex, lustrous, at posterior margin with projecting shield, laterally with one–two bristles. Metanotum trapezoid, insignificantly convex, near anterior angles and in posterior half with long solitary bristles.

Abdomen in region of segment III enlarged, anteriorly moderately, posteriorly highly tapering, terminally obtusely triangular, bordered laterally by ridge covered with long dense bristles on sclerotized base. Urogomphus highly produced, terminating in sclerotized spinule. Abdominal



35 Fig. 12. Pupa of *Dorcadion elegans* Kr.

tergites convex, medially with more or less perceptible troughlike longitudinal groove, at posterior margin of segments II–VI with long dense bristles directed backward forming transverse band. Abdominal tergite I glabrous, only with four–six bristles in transverse row. Body length 10–12 mm, width of abdomen 4.0 mm.

Material: Collected in the southern Urals near Ural'sk and in southern Orenburg. Adults 2, larvae 47, pupae 4.

Distribution: Steppe of southern Pravobereznii Urals, Lower Volga and west up to the Don River.

Biology: Inhabits steppe cereal-wormwood associations (*Festuca, Psathyrostachys*) comprising 35–50% of the vegetative cover. Beetles crawl in the first half of summer. Larvae live in the soil, inhabit the upper layer at a depth up to 10–12 cm occupied by the roots of cereal grasses. After hibernation, the larvae make cells in the soil at a depth of 7–10 cm in the second half of July or in August and pupate in them. Cell vertical or slightly oblique surface. Pupae lie in cells with their head upward. Pupal stage lasts about three weeks. Soil temperature during pupation 24.0–26.5°C. Young beetles appear in August. They overwinter in the cells and exit the following spring. On August 12th we found in the soil four larvae before pupation and five pupae and beetles. Generation—two-year cycle. Length of cell 15–20 mm, width 6–10 mm. Larvae often pack galleries with greenish frass. Weight of larvae before pupation up to 86 mg, pupae 80 mg, young beetles in cells before hibernation up to 73.1 mg.

3. Genus *Eodorcadion* Breun.

Breuning, 1947. *Misc. Entom. Paris*, 43: 142; Plavil'shchikov, 1958. *Fauna SSSR*, 23, pt. 1: 414–432; Cherepanov and Cherepanova, 1978. *Taksonom. i ekolog. chlenistonogikh Sibiri* (*nov. i maloizv. vidy fauny Sibiri*), 104–105.

Adult: Body stocky, comparatively short. Head with uneven punctation, occiput broadly rounded, medially with narrow groove, sinciput compressed, in region of frons slightly convex. Labrum massive, apically emarginate, disk convex, with short hairs, at anterior rounded angles with long black or dark brown bristles, basally covered with smooth glabrous parchmentlike plate. Antennae in females barely extending beyond middle 37 (*E. carinatum* (F.), *E. lutschniki* (Plav.)) or extending to posterior third of elytra (*E. grumi* (Suv.), *E. ptyalopleurum* (Suv.), *E. leucogrammum* (Suv.)), in males barely extending or not extending to apex of elytra (*E. carinatum* (F.), *E. lutachniki* (Plav.)) or extending beyond it by their last two–three segments (*E. ptyalopleurum* (Suv.), *E. grumi* (Suv.), *E. quinquevittatum* Hamm.)). Eyes highly emarginate, finely faceted, appear to occupy base of frontal tubercles on outer side. Pronotum laterally with extended tubercle that is apically elongate, generally as an acute spinule. Pronotal shield broad, flat, sometimes medially depressed like a trough, laterally generally with dense gray hairs. Elytra convex, with well-developed humeral ridge, with longitudinal, densely pubescent white bands (*E. quinquevittatum* (Hamm.), *E. lutschniki* (Plav.), and others) or without them (*E. grumi* (Suv.), f. typica, and others). Midtibiae in distal half on outer side with notch bearing brush of dense golden (*E. grumi* (Suv.), *E. ptyalopleurum* (Suv.), *E. leucogrammum* (Suv.)) or black (*E. quinquevittatum* (Hamm.)) bristles.

Egg: Elongate, at poles generally broadly rounded, white, becoming brownish with time. Chorion not transparent, with fine reticulate-cellular sculpture.

Larva: Body thick, white, sometimes with yellowish tinge. Head transverse, highly retracted into prothorax. Epistoma at anterior margin entire, transversely truncate (*E. humerale* (Gebl.), *E. carinatum* (F.), *E. lutschniki* (Plav.)) or with two large round projections (*E. quinquevittatum* (Hamm.), *E. leucogrammum* (Suv.), and others). Pronotum at anterior margin with white fringe having dense rusty hairs forming compact transverse band, which is entire posteriorly (*E. carinatum* (F.), *E. lutschniki* (Plav.)) or has two angular projections (*E. humerale* (F.), *E. ptyalopleurum* (Suv.), and others). Pronotal shield sclerotized, rusty (*E. humerale* (F.), *E. lutschniki* (Plav.), *E. carinatum* (F.)) or coriaceous, white (*E. grumi* (Suv.), *E. quinquevittatum* (Hamm.), and others). Eusternum convex, demarcated by deep groove, in anterior half and basally glabrous, beyond middle with long hairs forming transverse band (*E. leucogrammum* (Suv.)) or in anterior half additionally with short wide-set hairs (*E. quinquevittatum* (Hamm.) and others). Abdomen thick, weakly tapering toward tip. Locomotory ampullae well developed on abdominal segments I–VII. Anal pore transverse. In first instar larvae, anterior margin of epistoma with two spinules, outer side of mandible with one spinule, hypostoma in some species (*E. carinatum* (F.)) with two, in others (*E. quinquevittatum* (Hamm.) and others) with four spinules, and temporo-parietal lobes at anteroventral margin with one spinule (*E. quinquevittatum* (Hamm.)) or without it (*E. carinatum* (F.)). These spinules disappear after molt.

Pupa: Body stocky, dorsally curved. Head with produced frontal tubercles, between them with broad median longitudinal trough, on frons with rusty bristles. Antennae flexed laterad, in second half curved arcuately or semicircularly on ventral side. Pronotum convex, laterally with large produced tubercle, disk with rusty bristles dispersed in anterior half, forming clusters on hind clivus. Abdominal tergites in posterior half convex, here with dense rusty bristles forming transverse band, in anterior half compressed. Tip of abdomen with large urogomphus having sclerotized spinule terminally (*E. quinquevittatum* (Hamm.)) or without it, laterally with long rusty bristles on sclerotized base (*E. leucogrammum* (Suv.)) or here without perceptible sclerotization (*E. quinquevittatum* (Hamm.)).

Eight species of the genus *Eodorcadion* Breun. are known in northern Asia. Among them, *E. carinatum* (F.) inhabits the steppe zone from the 38 southern Urals to Trans-Baikal inclusive, divided at least into three subspecies. *E. lutschniki* (Plav.), *E. leucogrammum* (Suv.), *E. ptyalopleurum* (Suv.), and *E. quinquevittatum* (Hamm.) are distributed in the Tuvinsk basin only; *E. grumi* (Suv.) mostly in the southern Tannu-Ola ridge; *E. humerale* (Gebl.) from Tuva to the Pacific Ocean coast; and *E. brandti* (Gebl.) occupies the steppe biotopes in northeast Kazakhstan and Altai (southern spurs of the Chuisk ridge). All these species are discretely distributed within their range in individual colonies confined to definite places (Cherepanov and Cherepanova, 1975). The population of each colony is isolated from populations of other species of the very same genus for a long time. This is because the beetles, having lost the ability to fly, cannot accomplish large migrations. Moreover, mountain ranges rising to 1,500 m above mean sea level act as an impregnable barrier for them. Such isolation of species populations facilitated the formation of new endemic species within the limits of such restricted regions as the Tuvinsk (including Ulug-Khemsk) and Ubsa-Nursk basins.

Two basic directions are noted in the evolution of the genus *Eodorcadion* Breun. Of these, the first direction unifies the species *E. carinatum* (F.), *E. lutschniki* (Plav.), and *E. humerale* (Gebl.), characterized by the morphological homogeneity of larvae with a sclerotized pronotal shield. The second direction is characteristic of the species *E. grumi* (Suv.), *E. ptyalopleurum* (Suv.), *E. leucogrammum* (Suv.), and *E. quinquevittatum* (Hamm.) in whose larvae the pronotal shield is not sclerotized but coriaceous. The last two species, by the presence of broad notches at the anterior angles of the shield, maintain some closeness to the species of the first direction (*E. carinatum* (F.), *E. lutschniki* (Plav.)). Of the aforementioned species, the most primitive is *Eodorcadion carinatum* (F.). It may be assumed that the remaining species are of much later origin.

All the species of the genus *Eodorcadion* Breun. are ecologically associated with herbaceous plants. Beetles appear at June-end and are found up to the middle or end of August. They feed on tissues of green leaves of cereal grasses, nibbling them from the margins. They mostly infest cereal grasses. Females lay eggs on the underground part of stems. Larvae live in the soil and damage roots and underground parts of stems. They are often found in the sod. After the second or third hibernation, they make cells in the soil and pupate in them. Pupation of larvae is completed in the first half of summer, mainly in June. Pupal development lasts up to three weeks. Beetles that develop from the pupae emerge from the soil with underdeveloped gonads, require supplementary feeding, and live for four–six weeks. Generation–two- or three-year cycle.

Type species: *Lamia carinata* Fabricius, 1781.

KEY TO SPECIES

Adults

1 (2). Head and pronotum with dense gray or yellowish hairs forming on disk two bright common parallel paramedial bands. Antennae at base of segments with narrow grayish pilose ringlets. East of northern Asia from Tuva to Primor'e. . . . . 1. **E. humerale** (Gebl.)

2 (1). Head and pronotum without dense hairs or with dense hairs forming only individual spots. Antennae at base of segments without narrow pilose ringlets or with very broad ringlets (*E. brandti* (Gebl.)).

3 (6). Antennae and legs bright rust or rusty, sometimes with brownish tone.

39 4 (5). Elytra without white pilose longitudinal spinal bands or with bands (ssp. *gassneri* Breit.), of which humeral and outer bands medially not segregated longitudinally. From southern Urals to Shilka River. . . . . 2. **E. carinatum** (F.)

5 (4). Elytra always with white longitudinal spinal bands, of which outer band segregated medially into two and humeral band into two–three longitudinal bands. Tuvinsk basin. . . . . 3. **E. lutschniki** (Plav.)

6 (3). Antennae and legs black, sometimes only tibiae with dark rust tone.

7 (14). Antennae at base of segments without broad ringlets.

8 (13). Brushes on midtibiae consist of golden-yellow or brownish bristles.

9 (10). Elytra glabrous, without white longitudinal bands, with barely perceptible, very short hairs not forming continuous pubescence; if with white pilose longitudinal bands (m. *leucotaenium* (Suv., female), then tibiae with very dense gray pubescence. Ubsa-Nursk basin, northern Mongolia. . . . . 4. **E. grumi** (Suv.)

10 (9). Elytra with gray tender hairs forming continuous uniform pubescence or with narrow longitudinal or speckled discontinuous white bands.

11 (12). Elytra on disk glabrous, laterally with longidudinal speckled discontinuous white pilose bands. Sometimes these bands also present

on spinal side (inner and outer). Tuvinsk basin, mainly in western part of Chadansk Pass. . . . . 5. **E. ptyalopleurum** (Suv.)

12 (11). Elytra on disk entirely with tender gray hairs forming pubescence, often additionally with very narrow, distinct or faint (but not speckled) white longitudinal bands, their interspace pubescent. Tuvinsk basin in eastern part of Chadansk Pass. . . . . 6. **E. leucogrammum** (Suv.)

13 (8). Brushes on midtibiae consist of dense black bristles. Elytra lac-black, with sharply projecting, uniform, white longitudinal bands, their interspace glabrous, without pubescence. Tuvinsk basin. . . . . 7. **E. quinquevittatum** (Hamm.)

14 (7). Antennae at base of segments with broad pilose ringlets. Elytra with broad white longitudinal bands. Northwest Kazakhstan, Altai . . . . 8. **E. brandti** (Gebl.)

Larvae

1 (6). Pronotal shield sclerotized, yellowish. Epistoma at anterior margin without projections, entire.

2 (3). Abdominal tergites VIII–IX basally glabrous, only in posterior half with long sparse hairs. Transverse pilose band at anterior margin of pronotum posteriorly with distinct angular paramedial projections. . . . . 1. **E. humerale** (Gebl.)

3 (2). Abdominal tergites VIII–IX in anterior half with short, in posterior half with much longer hairs. Transverse pilose band at anterior margin of pronotum posteriorly with barely perceptible paramedial projections or without them.

4 (5). Hairs laterally on abdominal tergites erect, distance between them not less or even more than their length. . . . . 2. **E. carinatum** (F.)

40 5 (4). Hairs laterally on abdominal tergites bent (compactly compressed) toward middle, distance between them less than their length. . . . . 3. **E. lutschniki** (Plav.)

6 (1). Pronotal shield not sclerotized, coriaceous, whitish. Epistoma at anterior margin with two large round projections.

7 (10). Pronotum laterally at anterior margin of shield with narrow deep pigmented (yellow-brown) groovelike notch extending from anterior end of lateral longitudinal groove toward middle and slightly obliquely posteriorly.

8 (9). Dorsal locomotory ampullae in region of medial transverse ridge with coarse striae. . . . . 4. **E. grumi** (Gebl.)

9 (8). Dorsal locomotory ampullae in region of medial transverse ridge smooth, without striae. . . . . 5. **E. ptyalopleurum** (Suv.)

10 (7). Pronotum laterally at anterior margin of shield with broad deep yellowish-brown, sometimes triangular notch extending from anterior end of lateral longitudinal groove toward middle.

11 (12). Eusternum basally and in anterior half glabrous, beyond middle with long hairs forming transverse band. Abdominal tergites VIII–IX in anterior half (especially disk) glabrous, in posterior half with sparse hairs. . . . . 6. **E. leucogrammum** (Suv.)

12 (11). Eusternum basally glabrous, in anterior half with short, beyond middle with long hairs forming transverse band. Abdominal tergites VIII–IX in anterior half with short, in posterior half with long hairs. . . . . 7. **E. quinquevittatum** (Hamm.)

Pupae

1 (4). Pronotum at anterior margin with dense bristles forming transverse band interrupted medially. Abdominal tergite VII on disk with dense bristles forming an extensive field, sometimes divided by median longitudinal gap.

2 (3). Metanotum beyond middle with much denser bristles forming comparatively broad transverse band. Setigerous field on disk of abdominal tergite VII with barely perceptible median gap or without it. . . . . 2. **E. carinatum** (F.)

3 (2). Metanotum beyond middle with sparse bristles forming transverse interlacing row or distinct rarefied transverse band. Setigerous field on disk of abdominal tergite VII with broad longitudinal gap. 3. **E. lutschniki** (Plav.)

4 (1). Pronotum at anterior margin glabrous or, at most, with sparse dispersed bristles not forming distinct transverse band. Abdominal tergite VII with sparse bristles forming sometimes one longitudinal paramedial cluster.

5 (8). Pronotum laterally at base of lateral tubercles with deep pitlike notch. Abdominal tergites generally with two transverse setigerous bands, of which anterior (rarefied) band only sometimes absent.

6 (7). Metanotum with a few sparse bristles forming transverse interlacing row or rarefied transverse band of not more than two rows of bristles. . . . . 4. **E. grumi** (Suv.)

7 (6). Metanotum with numerous dense bristles forming broad transverse band of four–five rows of bristles. . . . . 5. **E. ptyalopleurum** (Suv.)

41 8 (5). Pronotum laterally at base of lateral tubercles without deep pitlike notch or with barely perceptible division. Abdominal tergites

with one transverse setigerous band; anterior (rarefied) band generally absent or in form of an interlacing transverse row.

9 (10). Abdominal tergites in anterior half before middle without perceptible transverse notch. Urogomphus apically without spinule, sometimes with barely perceptible sclerotization .... 6. **E. leucogrammum** (Suv.)

10 (9). Abdominal tergites in anterior half before middle with transverse notch. Urogomphus apically with spinule or with distinct sclerotization................... 7. **E. quinquevittatum** (Hamm.)

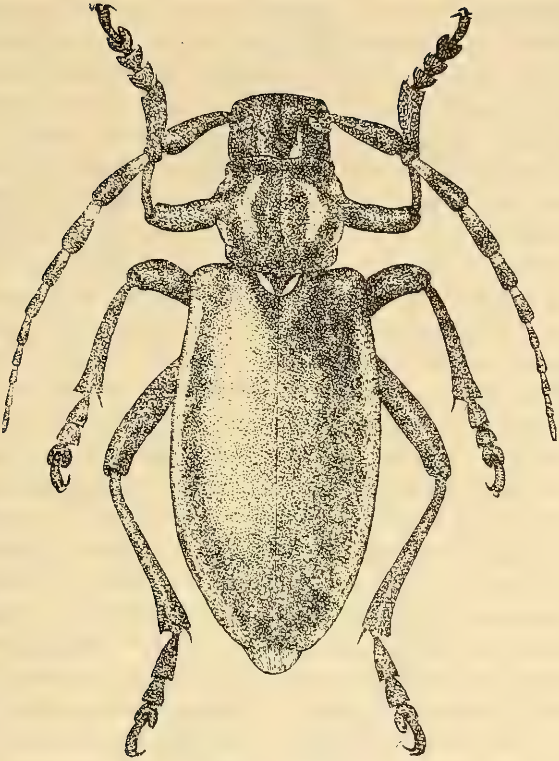
1. **Eodorcadion humerale** (Gebl.)

Gebler, 1823. *Mem. Soc. Mosc.*, 4: 130 (*Dorcadion*); Plavil'shchikov, 1958. *Fauna SSSR*, 23, pt. 1: 434–436; Cherepanov and Cherepanova, 1978. *Takson. i ekolog. chlenistonogikh Sibiri* (*nov. i maloizv. vidy fauny Sibiri*), 107–109.

Adult (Fig. 13): Characterized by smooth lustrous (rarely matte) black elytra and variegated antennae. Head between antennae with narrow deep median longitudinal groove passing over to occiput, with minute sparse evanescent punctation, with adherent gray hairs forming specks on frons and two longitudinal paramedial bands on sinciput. Frons convex, near base of antennae raised tubercularly, anteriorly smooth, without longitudinal groove. Genae broad, entirely with grayish pubescence. Occiput smooth, broadly rounded. Eyes broadly emarginate; ocular lobes with narrow interspace between. Antennal apices extending beyond middle (female) or up to hind clivus of elytra. First antennal segment thick, with minute punctation, apically rounded, here without projecting ridge; 3rd–9th segments at base with dense white pilose ringlet, remaining part with minute sparse dark hairs not forming continuous pubescence.

Pronotum transverse, laterally with acute spiniform tubercle, with deep uneven, on disk evanescent, often totally imperceptible punctation, med-
42 ially with distinct or sometimes faintly perceptible longitudinal groove, with compact adherent gray or grayish-yellow hairs forming minute specks laterally and on disk one, sometimes broad, longitudinal paramedial band. Pronotal shield broad, flat, posteriorly rounded, laterally with compact white pilose fringe.

Elytra medially more (female) or less (male) enlarged, tapering toward base and apex, near humeri (especially in females) longitudinally compressed by projecting cuneiform marginal ridge extending almost up to apex; humeri rounded, disk smooth, without longitudinal ridges, glabrous, without longitudinal pilose band (f. typica), sometimes matte (ab. *coriarium* Plav.), sometimes with very narrow white pilose bands (m. *mogissemium* Suv.) or with three–four longitudinal ridges covered with white



41 Fig. 13. *Eodorcadion humerale* (Gebl.).

hairs (m. *trabeatum* Jak.) or with numerous pilose spots (m. *impluviatum* Fald.) or almost entirely pilose (m. *densevestitum* Breun.). Ventral side of body continuously covered with compact adherent white or grayish-yellow pubescence. Body, antennae, elytra, and legs black. Body length 13–14 mm.

Larva (Fig. 14): Belongs to the group in which anterior margin of epistoma entire and pronotal shield sclerotized. Head rusty, highly retracted into prothorax. Epistoma slightly convex, with distinct medial suture, laterally fusing with temporo-parietal lobes, frontal sutures not perceptible, with anterior margin entire, here with 6–10 long bristles, with brownish fringe, near anterior angles or sometimes medially with transverse striae, behind fringe with piliform bristles in transverse row. Hypostoma uniformly convex, short, with fine transverse striae, anterior margin broadly rounded, laterally demarcated by sutures incurved almost from base, disk with pair of short wide-set bristles. Temporo-parietal lobes in anterior

half rusty, transversely striate, here with thin solitary bristles forming rarefied dispersed transverse row, ventrally pushed cuneately between hypostoma and maxillae. Antennae very short, whitish, barely projecting from antennal socket. Hyaline ocelli lie close below bases of antennae. Clypeus large, convex, hyaline, barely tapering toward apex, white, basally brownish. Labrum transversely oval, apically obtuse, densely setose. Mandibles massive, in anterior half or only basally rusty-red, here transversely striate,
43 in remaining part black, much smoother, apically obliquely truncate, on outer side closer to base with pair of transversely wide-set bristles. Laciniae thick, apically with long dense bristles. Maxillary palp slightly projecting beyond apex of lacinia. Labial mentum transverse, convex, hyaline, basally with sparse bristles in transverse row. Submentum* parallel-sided, convex, hyaline, laterally with pair of close-set bristles.

Pronotum transverse, sloping toward head, at anterior margin white, broadly rounded, here with dense setiform hairs forming continuous (medially not interrupted) broad transverse band, behind which lies smooth lustrous area with yellowish tone passing over laterad. Pronotal shield convex, yellowish-rust, with large setigerous smooth punctures, basally with setiform hairs forming transverse band, laterally demarcated by longitudinal grooves uniting anteriorly with transverse triangular notches. Sides of pronotum with long dense hairs. Prothoracic presternum and eusternum with deep setigerous punctures. Hairs forming comparatively dense pubescence. Eusternum basally glabrous, coriaceous. Basal part of prosternum (basisternum) medially glabrous, laterally with dense rusty hairs. Meso- and metasterna medially with transverse groove, in front of which dense hairs form continuous transverse band, posteriorly glabrous, without hairs.

Abdomen comparatively thick, laterally with bright projecting setiform hairs. Dorsal locomotory ampullae convex, transversely oval, medially divided by common longitudinal groove, with two transverse folds (ridges), of which anterior one with short solitary bristles. Ventral locomotory ampullae shagreen, divided by deep transverse groove, before which lie numerous and behind it sparse hairs. Tergites and sternites of abdominal segments VIII–IX basally glabrous, in posterior half with long sparse hairs. Segment X (tip) with numerous long hairs. Body length 25–27 mm, width of head 3.0–3.2 mm.

Material: Collected in Trans-Baikal and Tuva. Adults 89, larvae 9.

Distribution: From Lake Baikal to the Pacific Ocean coasts, from northern Mongolia, northern China, Korea to the Vitimsk highland and mouth of the Amur River. From northern Mongolia the insects enter the

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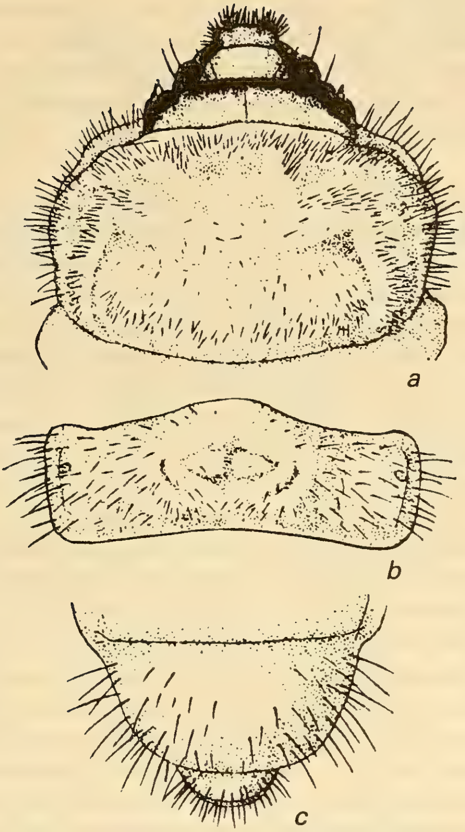
*Erroneously given as "mentum" in Russian original—General Editor.



42 Fig. 14. Larva of *Eodorcadion humerale* (Gebl.).

a—head and pronotum; b—abdominal tergite with dorsal locomotory ampulla; c—tip of abdomen (dorsal view).

limits of Tuva where the center of their areal is the basin steppes of the Anon, Shilka and upper Selenga Rivers.

Biology: Inhabits open steppes. Often found in Trans-Baikal, rarely in Tuva. Occupies zones of grass steppes. Beetles crawl from June to August. Maximum number observed June-end and first half of July. For example, during systematic collections in different years, 89 beetles were caught during summer—25 (28.1%) in June, 62 (69.7%) in July, and 2 (2.2%) in August. Larvae live in the upper soil layer, make galleries mainly in the sod, and feed on tissues of herbaceous plants. Before pupation (laboratory study) the larvae make a 20-mm long and 10-mm wide cell in the soil. Larval weight, based on three individuals of last instar, 224–400 mg.

44 2. **Eodorcadion carinatum** (F.)

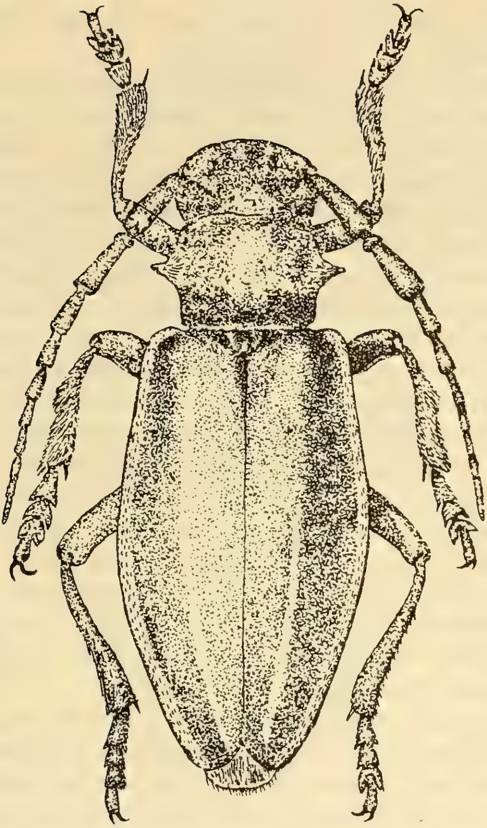
Fabricius, 1781. *Spec. Insect.*, 222 (*Lamia*);—*involvens* Ganglbauer. 1883. *Verh. Zool. bet. Ges. Wien*, 512 (*Neodorcadion*);—*gassneri* Breit, 1917. *Kol. Rundsch.*, 6: 63 (*Neodorcadion*); Plavil'shchikov, 1958. *Fauna SSSR*, 22, pt. 3: 436-441; Cherepanov and Cherepanova, 1978. *Takson. i ekolog. chlenistonogikh Sibiri* (*nov. i maloizv. vidy fauny Sibiri*), 109–114.

Adult (Fig. 15): Characterized by comparatively short thick body and very convex elytra. Head with uneven punctation and short compact adherent, easily erasing white hairs. Frons short and broad, laterally emarginate, with minute, sometimes evanescent punctation, medially with yellowish-brown longitudinal line. Sinciput slightly compressed, with deep bold punctation. Eyes broadly emarginate, ocular lobes with narrow interspace between, finely faceted. Antennae extending beyond middle (female) or almost up to apex of elytra (male). First antennal segment thick, apically rounded, with fine punctation, perceptibly shorter than 3rd segment (female) or equal to it (male).

Pronotum convex, laterally with acute spiniform, apically slightly recurved tubercle, disk convex, with large deep punctures, medially with smooth longitudinal, sometimes broad band, with unevenly distributed minute adherent hairs. Pronotal shield short, triangular, posteriorly narrowly rounded, medially with longitudinal glabrous trough, laterally with dense adherent white hairs. Elytra medially enlarged, disk very convex, laterally near humeral tubercles broadly or narrowly longitudinally compressed, significantly tapering toward apex, here individually narrowly rounded. Legs thick (in females fore- and mid-, in males only midlegs); tibiae on outer side in distal half with notch covered with dense bristles forming brush, medially with distinct projection. Body ventrally with compact adherent gray hairs. Sternite V apically not obtuse or slightly emarginate. Three subspecies are well distinguished within *Eodorcadion carinatum* (F.).

1. *Eodorcadion carinatum carinatum* (F.): Body large (length 11–20 mm), stocky, comparatively thick, rusty or dark rust. Elytra near humeral tubercles broadly compressed, with minute striate punctation, matte, laterally with more or less broad pilose fringe extending from humeral tubercle up to apex (f. typica), sometimes additionally with one–three narrow white pilose bands on disk (m. *blessigi* Ganglb., *bramsoni* Pic, *nigrescens* Breun.).

45 2. *Eodorcadion carinatum involvens* Fisch.: Body small, perceptibly smaller than preceding subspecies (length 9–18 mm), less enlarged, rusty, rusty-brown or dark brown. Elytra lustrous, not matte, without white pilose bands (f. typica) or with one humeral white band (m. *humerolineatum* Plav.), sometimes on disk additionally with one–three bands (m. *dorsolineatum*



44 Fig. 15. *Eodorcadion carinatum* (F.).

Plav.). Head and pronotum often black (ab. *nigricolle* Plav.), rarely head entirely black (ab. *nigrum* Plav.).

3. *Eodorcadion carinatum gassneri* Breit.: Body stocky, large (length 14–19 mm), rusty. Elytra near humeral tubercles with barely perceptible, narrow longitudinal notch, with fine evanescent punctation, with six narrow white pilose bands, of which four, counting from suture, situated in longitudinal troughlike grooves. Sometimes between the 3rd and 4th bands a very narrow, short, but distinct band perceptible.

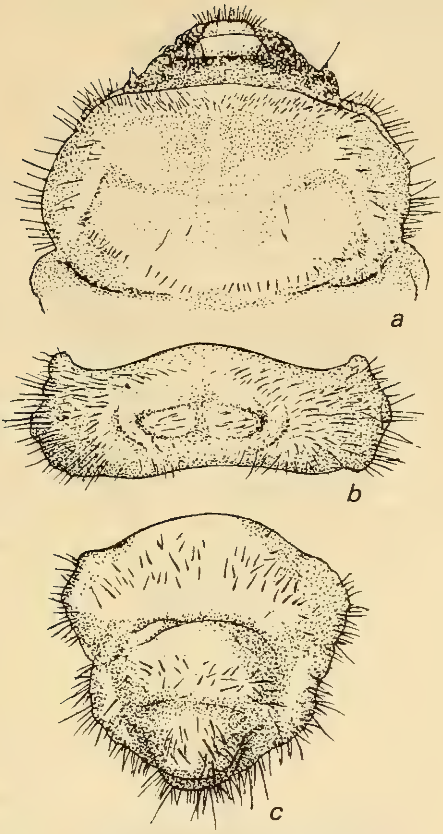
Taxonomic notes: There are transitional forms between these subspecies, which are difficult to relate to one or the other subspecies. Investigations of male genitalia revealed that they are similar in all the aforementioned subspecies but that individual variations occur in location and length of bristles at the apex of the parameres and in the shape of the edeagus (in some insects within one and the same subspecies, it is slightly obtuse apically, while in others, narrowly rounded or with barely perceptible notch).

46 *Egg*: White, elongate, rounded at poles. Chorion with fine reticulate sculpture, with matte tone. Length 3.4 mm, width 1.2 mm.

Larva (Fig. 16): Readily recognized by structure of pronotal shield, uniform anterior margin of epistoma and location of pubescence. Head parallel-sided, highly retracted into prothorax. Epistoma flat, slightly whitish, anterior margin smooth, entire, with insignificantly produced angles, with broad brownish fringe, laterally fusing with temporo-parietal lobes (frontal sutures not perceptible), medially along entire length divided by sharp longitudinal suture, in medial third with short dispersed setiform hairs in three transverse rows. Hypostoma transverse, four times wider than long, transversely moderately convex, with rounded anterior and acutely produced posterior angles, along perimeter rusty-brown, disk with much brighter tone. Temporo-parietal lobes in anterior half with barely perceptible, short solitary hairs, near base of antennae with lightly pigmented ocelli. Antennae very short, barely projecting from antennal sockets. Clypeus broad, trapezoid, convex, smooth, white or with brownish tinge. Labrum short, apically obtuse or broadly rounded, at anterior margin and laterally with short dense bristles. Mandibles apically obliquely and broadly truncate, on inner side with transversely oblique ridge, on outer side with medial transverse striae or groovelike troughs.

Pronotum barely sloping toward head, at anterior margin with broad white fringe, at posterior margin with dense rusty hairs forming compact transverse band, with posterior paramedial angular projection. Behind this pilose band pronotum glabrous, with coarse yellowish-rust punctation, lustrous. Pronotal shield insignificantly convex, sclerotized, matte, yellowish, with coarse punctures and minute setiform hairs, laterally demarcated by short longitudinal grooves uniting anteriorly with transverse, more pigmented triangular notch. Prothoracic presternum short, disk whitish, laterally with large rusty glabrous lustrous spot, with short sparse rusty hairs. Eusternum convex, basally glabrous, in anterior half with rusty hairs forming more compact medial transverse band. Base of prosternum (basisternum s. sternellum) glabrous, lustrous, laterally with dense rusty hairs forming small cluster. Meso- and metasterna with deep medial transverse groove, in anterior half with dense rusty hairs, in posterior half glabrous, lustrous.

Abdomen thick, barely tapering toward tip, laterally with sparse erect projecting rusty hairs. Dorsal locomotory ampullae convex, medially with common longitudinal troughlike groove divided by two transverse grooves that unite laterally at an acute angle with transverse ridge between them;

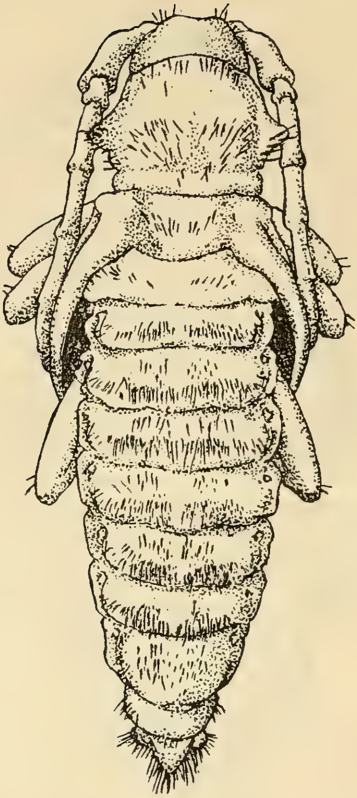


45 Fig. 16. Larva of *Eodorcadion carinatum* (F.).

a—head and pronotum; b—abdominal tergite with dorsal locomotory ampulla; c—tip of abdomen (ventral view).

ridge with short bristles. Ventral locomotory ampullae convex, divided by one transverse groove, from which sometimes arise faint oblique striae. Abdominal tergites VIII–IX in anterior half with short sparse, in posterior half with long, sometimes dense hairs. Body length up to 22 mm, width of head 2.2–3.5 mm. In first instar larvae, anterior margin of hypostoma with two small spinules that disappear after molt.

Pupa (Fig. 17): Distinguished from pupae of other species by presence of transverse setaceous band at anterior margin of pronotum and absence
47 of bristles on foreclivus. Head between antennae barely compressed, medially with sharply projecting, longitudinal brownish or barely perceptible



45 Fig. 17. Pupa of *Eodorcadion carinatum* (F.).

(in early stage of development) line, inner to eyes with solitary or paired bristles, at anterior margin near clypeus with paired thick bristles laterally. Occiput barely convex, broadly rounded. Labrum in anterior half with numerous bristles forming one common cluster, sometimes divided medially into two separate clusters. Antennae flexed laterad, in second half extending beyond midfemora, their apices inclining ventrad.

Pronotum convex, transverse, at apex slightly narrower than at base, laterally with produced conical setigerous tubercle, at anterior margin with bristles forming transverse narrow or broad band, disk (in region of foreclivus) glabrous, in posterior half with bristles forming two curved clusters extending from middle of base toward lateral tubercles (*E. c. involvens* Fisch.) or forming common triangular cluster occupying a large part of hind clivus (*E. c. carinatum* (F.)). Mesonotum posteriorly with slightly produced shield, along its sides with bristles forming two bands that diverge toward base of elytra. Metanotum short, almost one-fourth its width*, medially with thin bristles forming transverse rarefied or comparatively dense band.

Abdomen medially more (female) or less (male) enlarged, markedly tapering toward tip. Abdominal tergites in posterior half convex, medially with common longitudinal groove, paramedially with long rusty hairs forming compact transverse band tapering laterad, in anterior half with sparse bristles. Tergite VII posteriorly broadly rounded, disk convex, with unevenly dispersed sparse or paramedially much denser bristles. Tergite VIII transverse, disk glabrous, laterally with solitary bristles. Tip of abdomen with large setiform urogomphus produced dorsally and terminating in small sclerotized spinule; abdominal tip ventrally obtuse, laterally bound by ridge covered with long dense rusty bristles. Valvifers of female hemispherical, small, contiguous. Body length 11–21 mm, width of abdomen 4–6 mm.

Material: Collected in Altai, Tuva, Trans-Baikal, Kulunda, and northern Kazakhstan. Adults 579, larvae 75, pupae 11 males and females, larval exuviae with beetles from cells 6; among these were *Eodorcadion carinatum carinatum* (F.)—larvae 9, pupae 4, beetles 44 and *E. c. gassneri* Breit.—beetles 4.

Distribution: Southern steppes from the Urals to the Shilka River. Northern Mongolia.

Biology: Inhabits cereal, wormwood-cereal grass steppes; found on wastelands and especially virgin fallow lands of terraced river valleys, lakes; sometimes colonizes cultivated lands. Along the southern steppe slopes ascends mountains up to 1,400–1,500 m above mean sea level. Inhabits fields with compact and rarefied herbaceous cover, but always prefers to infest plant associations which include cereal grasses. Found sporadically, at places observed in large numbers.

Beetles observed from June to August with individuals seen in early September. Maximum number observed in July. For example, in the southern regions of Siberia, we caught in different years 415 beetles—28.9% in June, 63.2% in July, 7.7% in August, and 0.2% early September. Beetles crawl on the ground, climb stems of plants, and feed on green leaves of cereal grasses. Their gonads mature during this period. In gardens, the females commence oviposition eight days after emergence from the pupal
48 cell. They lay eggs on the underground part of growing cereal grasses, often aligning them vertically near the stems of herbaceous plants. Fecundity of females comparatively low. In the ovary of a female caught in nature (in Tuva), 15 mature eggs were found (June 23rd) and in another

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*Erroneously given as "length" in Russian original—General Editor.

6 mature eggs (July 9th). In a garden-raised female (at Kokchetav), seven mature eggs were found on the seventh day of her life.

Larvae hatch from eggs 18–21 days (average, 18.7 ± 0.1) after oviposition. We placed 59 eggs under observation. Hatching starts in June and is completed in September. Young larvae bore into rhizomes of growing cereal grasses and feed on their tissues. Larvae of late instars live in the sod, make galleries in the soil, and fill them with frass consisting of a gray or greenish mass. This indicates that the larvae feed on the tissues of roots, rhizomes and green parts of herbaceous plants (stems, leaves). In Tuva, larvae were found most often in the sod of *Agropyrum cristatum*, *Elymnus dhauricum*, and other cereal grasses at a depth of 3–10 cm but some were found under stones. In the outskirts of Kokchetav, they were found in the sod of *Agropyrum repens* and *A. pectiniforme*. Larvae of the last instar, after the second hibernation, make a cell in the soil at a depth of 3–10 cm and pupate in it. Length of cell 20–30 mm, width 7–14 mm. Cells are horizontal. Pupae lie on their dorsal side in them.

Pupation begins in May and is completed in the second half of June. Maximum pupae observed at the end of the first and beginning of the second ten days of June. For example, in the environs of Kokchetav while digging on June 9th, we found 22 individuals—nine pupae, one larva before pupation, and twelve midinstar larvae. There were about three individuals per square meter. The soil temperature at a depth of 3.0 cm was 19.5°C. The pupal stage lasts about three weeks. Developed beetles emerge on the soil surface the same summer and require supplementary feeding. They are most active in warm clear weather. In hot weather, they hide in shade or climb plants.

Table 5. Weight indices (mg) of *Eodorcadion carinatum involvens* Fisch. (based on material collected in Tuva in 1970, 1976)

Length of body, mm	[No. of specimens]*	Min.	Max.	M ± m	%
			Pupae		
13–14	20	121.0	190.5	157.0 ± 4.3	100
15–16	19	142.0	245.0	207.1 ± 7.7	131.7
17–18	2	276.0	292.0	284.0 ± 8.0	180.9
			Beetles		
11–12	7	103.0	163.0	123.1 ± 8.4	100
13–14	13	120.0	188.0	146.2 ± 6.2	118.8
15–17	6	190.0	240.0	214.0 ± 6.7	173.9

*Omitted in Russian original—General Editor.

Weight indices of *Eodorcadion c. carinatum* (F.) (five individuals) are as follows: pupae 231–456 mg (334.5 ± 41.0), beetles 177–344 mg (265.6 ± 35.0), and of *E. c. involvens* Fisch. (27 individuals): pupae 121–292 mg (183.2 ± 8.4), beetles 97–240 mg (154.2 ± 7.5). These observations indicate that weight correlates to a considerable extent with body length (Table 5). In pupae, with an increase in body length by 1.0 mm, the weight increases by 50.1–76.9 mg (31.7–49.2%), in beetles by 23.1–67.8 mg (18.8–55.1%). It may be assumed that a similar degree of increase in weight occurs in other species of the genus *Eodorcadion* Breun. also.

49 By nibbling the roots and basal parts of stems of cereal grasses, the larvae of *Eodorcadion carinatum* (F.) cause plants to lodge (Plavil'shchikov, 1958). However, the damage caused in fields by the larvae of this species is insignificant and occurs quite rarely.

3. **Eodorcadion lutschniki** (Plav.)

Plavilstshikov [Plavil'shchikov], 1937. *Sborn. ent. old. Nar. mus. Praze*, 15: 23 (*Neodorcadion*); Plavil'shchikov, 1958. *Fauna SSSR*, 23, pt. 1: 458–460; Cherepanov and Cherepanova, 1978. *Takson. i ekol. chlenistonogikh Sibiri* (*nov. i maloizv. vidy fauny Sibiri*), 114–118.

Adult (Fig. 18): Readily recognized by bright rusty antennae and legs as well as location of white longitudinal bands on elytra. Head with uneven punctation, with short gray, easily erasing hairs forming minute specks. Frons parallel-sided, slightly convex, broad, with fine evanescent punctation, medially with thin brownish longitudinal line passing posteriorly to occiput, with produced antennal tubercles having broad notch frontally. Sinciput compressed, with large deep punctures. Eyes barely convex, broadly emarginate, very finely faceted. Antennae thin, with minute adherent hairs, their apices extending beyond middle (female) or up to hind clivus*. First antennal segment perceptibly thicker than 3rd, shorter than or equal to it.

Pronotum transverse, uniformly tapering toward apex and base, disk convex, with not very dense, sometimes uneven punctation, with specklike, not dense pubescence, medially with longitudinal groove dividing main band in two, laterally with produced tubercle terminating in small, generally reddish spinule. Pronotal shield triangular, posteriorly narrowly rounded, flat, with minute sparse punctation, with sparse, laterally sometimes dense hairs.

Elytra convex, beyond middle moderately enlarged, toward base gently, toward apex steeply tapering, apically individually rounded, with longitudinal grooves in which lie dense white pilose longitudinal bands (five bands) extending from base to apex, of which 2nd and 4th bands, counting

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*Of elytra—General Editor.

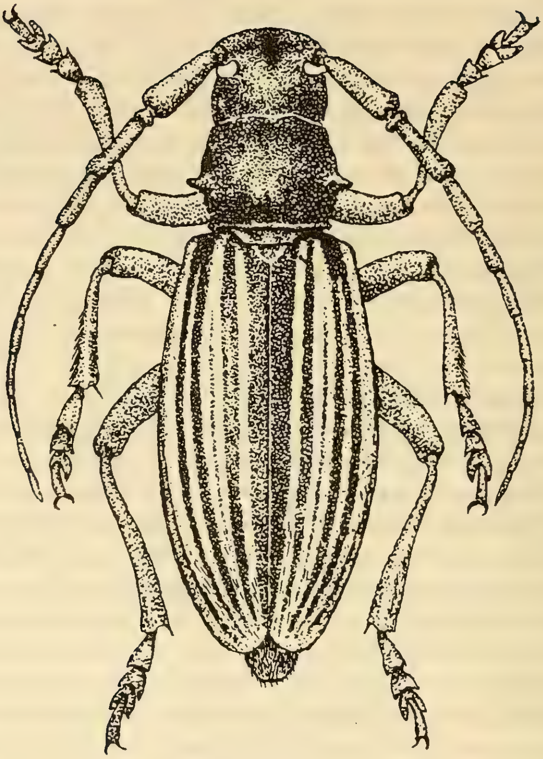


Fig. 18. *Eodorcadion lutschniki* (Plav.).

from suture, often longitudinally segregated by narrow glabrous interspace. Generally, intervals between bands smooth or with evanescent, barely perceptible, minute punctures. Body ventrally with dense gray adherent pubescence. Foretibiae on outer side smooth, in distal half without notch; midtibiae with gentle notch covered with short dense golden-yellow bristles forming brush. Body black or blackish-brown, head rusty-red, apex of mandibles black, antennae, legs, pleurae of elytra and tip of abdomen rusty (f. typica), sometimes sinciput and frons more or less black (ab. *victori* Plav.). Body length 13–19 mm.

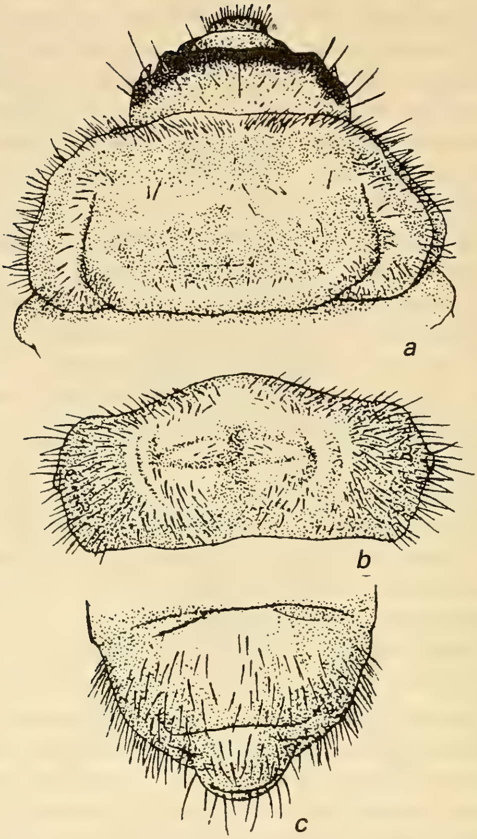
Egg: White, elongate, at poles broadly rounded, with very compact cellular sculpture forming shagreen matte texture. Length 3.2 mm, width 1.0 mm.

Larva (Fig. 19): In sclerotization of pronotal shield, similar to the larvae of *E. humerale* (Gebl.) and *E. carinatum* (F.), but distinguished

from them by much denser adherent pubescence on abdominal tergites. Head short, parallel-sided, highly retracted into prothorax. Epistoma distinctly convex, at anterior margin entire, smooth, without projections, only with produced angles, with dark brown (medially much brighter, rusty) fringe, with sharp (in anterior half dark brown, in posterior half bright) medial longitudinal suture, in anterior half with thin piliform bristles in two transverse rows, laterally fusing with temporo-parietal lobes; frontal sutures not perceptible. Hypostoma short, four–five times wider than long, at anterior angles gently rounded, in region of gular band (medially) more convex, with transverse, oblique striae, dark rust, at posterior angles whitish (as if whitewashed). Temporo-parietal lobes (sides of head) at anterior margin with dark brown or rusty fringe forming continuous band around narrow antennal sockets, behind this fringe with whitish pitlike
51 setigerous pores in transverse row. Antennae very short, three-segmented, whitish, barely projecting from antennal sockets. Clypeus white, basally with rusty tinge, convex, large, trapezoid, considerably tapering anteriorly. Labrum transverse, apically widely rounded or slightly obtuse, whitish, often with rusty tinge, in anterior half with dense coarse bristles. Mandibles elongate, black (only basally rusty), apically obliquely truncate, inner to cutting edge pockmarked, with large ridge extending obliquely from middle of upper margin toward lower denticle.

Pronotum weakly tapering anteriorly, anterior margin gently rounded, here with broad white fringe, behind which dense rusty hairs forming compact transverse band that unites laterally with common pubescent field. Behind transverse pubescent band, pronotum glabrous, lustrous, brownish, with fine striations. Pronotal shield convex, sclerotized, with yellowish tone, with white round or longitudinal pitlike punctures that sometimes fuse into separate squares, basally with bristles forming transverse row, disk with minute individual bristles in white pitlike punctures, laterally demarcated by deep longitudinal grooves that unite anteriorly with triangular dark rusty transverse notches, which demarcate anterior angles of shield. Presternum with sparse uniform hairs on disk, laterally with glabrous lustrous rusty square. Eusternum convex, with long rusty hairs curved mediad, only basally with narrow glabrous band.

Abdomen thick, barely tapering toward tip, laterally with dense recurved hairs. Dorsal locomotory ampullae convex, coriaceous, lustrous, divided by two transverse grooves uniting laterally. Ridge between these grooves transversely extended, medially with longitudinal trough, with short bristles curved mediad. Abdominal tergites with dense adherent pubescence around locomotory ampullae. Ventral locomotory ampullae moderately convex, divided by transverse groove, anterolaterally surrounded by sparse rusty incurved hairs. Abdominal tergites VIII–IX on disk entirely with

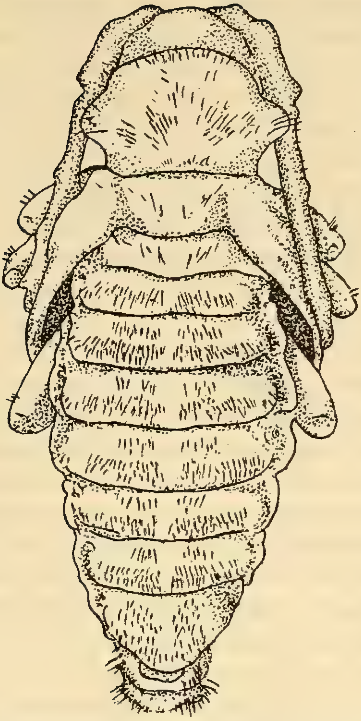


50 Fig. 19. Larva of *Eodorcadion lutschniki* (Plav.).

a—head and pronotum; b—abdominal tergite with dorsal locomotory ampulla; c—tip of abdomen (ventral view).

uniform, comparatively long rusty hairs. Sternite VIII entirely, sternite IX in posterior half and laterally with rusty, not very dense hairs. Body length of last instar larvae up to 25 mm, width of head 3.2 mm. In first instar larvae, anterior margin of hypostoma with two sclerotized, wide-set spinules that disappear after molt.

Pupa (Fig. 20): Similar to the pupa of *Eodorcadion carinatum* (F.), but distinguished from it by location of bristles on pro-, meso-, and metanota. Body stocky, thick. Head on occiput broadly rounded, on sinciput flat or insignificantly compressed, between antennae with broad longitudinal trough, near base of antennae, before clypeus and inner to ocular



50 Fig. 20. Pupa of *Eodorcadion lutschniki* (Plav.).

lobes, with numerous solitary or paired bristles. Labrum apically with short lateral bristles. Antennae in second half semicircular, their apices inclining toward midtarsi.

Pronotum convex, in females transverse, in males not longer than its basal width, laterally with large produced tubercle, at anterior margin with bristles forming transverse band, posteriorly beyond middle on disk with numerous bristles forming four clusters—two smaller lateral and two larger inner divided by longitudinal groove. Lateral tubercles of pronotum with sparse bristles. Mesonotum slightly convex, posteriorly with directly truncate margin, with a few bristles forming two indistinct lateral clusters. 52 Metanotum medially with longitudinal groove, with minute sparse bristles forming interlacing transverse row (in *Eodorcadion carinatum* (F.), meso- and metanota with much denser bristles).

Abdomen medially insignificantly enlarged. Abdominal tergites convex, medially with narrow longitudinal groove, paramedially in posterior half with long dense rusty adherent hairs forming broad transverse band, in anterior half glabrous or with solitary (sparse) hairs. Abdominal tergite VII* posteriorly narrowly rounded, basally glabrous, disk with numerous dense (female) or sparsely dispersed (male) bristles forming extensive field divided medially by longitudinal glabrous band. Tergite VIII glabrous, only laterally with individual bristles. Urogomphus at tip of abdomen obtusely extended dorsally, laterally (in dorsal view) with long rusty bristles, terminally with barely perceptible spinule (in *E. carinatum* (F.), this spinule is distinct). Tip of abdomen triangularly obtuse ventrally, laterally bound by ridges enlarging ventrad and covered with long dense rusty bristles. Valvifers of females slightly elongate, bent toward each other, apically with small round tubercle. Body length 14–20 mm, width of abdomen 5.0–6.5 mm.

Material: Collected in Tuvinsk basin. Adults 344, larvae 45, pupae 3 males and 4 females, larval exuviae with beetles from cells 1.

Biology: *Eodorcadion lutschniki* (Plav.) inhabits cereal-wormwood in the cereal-wormwood steppes of Karaganda in Tuvinsk basin. It is one of the endemic species of Tuva. Most often, it is found in river valley terraces not flooded by high waters. It is distributed at altitudes up to 800–900 m above mean sea level; mountains rising to 1,500 m are impregnable. Ecologically associated with cereal grasses (*Stipa*, *Koeleria*, *Diplachne*, *Festuca*, and others) and found in colonies. Colonies are maintained at the very same place for several years.

Beetles live from mid-June to August-end. Maximum number found during last ten days of July. Beetles disappear late August. During the collection season of 1947–1949, 273 beetles were caught—34.8% in June, 47.6% in July, and 17.6% in August. Beetles are most active in warm weather in the second half of the day and in the evening. In the morning and during hot diurnal hours, they climb plants. They require supplementary feeding and damage green leaves of cereal grasses. Their gonads mature during this period. On dissecting sexually mature females, we found 6 to 35 eggs in their ovaries. Oviposition begins by June-end and is completed during the last ten days of August. Eggs are aligned by females in the sod near rhizomes of cereal grasses. Embryonic development continues for 15–17 days (average 15.5 ± 0.1). We kept 39 eggs under observation. In individual cases, egg development is prolonged to three–four weeks.

Hatching of larvae begins in July and is completed in September. The developed larvae bore into rhizomes of growing cereal grasses and feed on their tissues. Larvae of mid- and late instars live in the soil and in sods, feed on tissues of young roots of cereal grasses, and sometimes

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*Erroneously given as "VIII" in Russian original—General Editor.

Table 6. Development of *Eodorcadion lutschniki* (Plav.)

Year	May	June	July	August	September	October
1st	L	LPAE	PAEL	AEL	EL	L
2nd	L	L	L	L	L	L
3rd	L	LPAE	PAEL	AEL	EL	L

nibble the underground part of stems. Larvae of the last instar, after the second hibernation, make a cell in the upper soil layer or in the sod. For this purpose, they make rotary movements by which the adjoining layer of soil becomes compact and the inner walls of the cell are polished.

Pupation begins early June and is completed by June-end. Maximum number of pupae observed in the second half (end of second ten days) of June. Beetles emerge two weeks after pupation. Thus, under laboratory conditions simulating natural conditions, larvae were in the stage of preparation for pupation on June 1st–2nd, pupated by the 8th of this month,
53 and on June 19th beetles emerged from the pupae. Five insects were placed under observation.

Emergence of young beetles begins mid-June and is completed during the first ten days of July. Beetles remain in the cell for not more than one week. Emergence of beetles from the soil begins during the second half (second ten days) of June and is completed mid-July. Generation—two-year cycle (Table 6). Based on seven individuals, the weight of larvae before pupation was 294–399 mg (356.0 ± 14.8), pupae 281–368 mg (328.8 ± 12.4), young beetles before emergence from cells 203–257 mg (251.9 ± 6.8). Larvae in the soil remain in the root zone of cereal grasses and are generally not found beyond it. At the sites of colonization, not more than one larva is usually found per square meter.

4. **Eodorcadion grumi** (Suv.)

Suvorov, 1909. *Russk. entom. obozr.*, 9: 80 (*Neodorcadion*); Plavil'shchikov, 1958. *Fauna SSSR*, 23, pt. 1: 449–451; Cherepanov and Cherepanova, 1978. *Takson. i ekol. chlenistonogikh Sibiri* (*nov. i maloizv. vidy fauny Sibiri*), 119–123.

Adult (Fig. 21): Distinguished from other species by more elongate body, long antennae in males extending beyond apex of elytra by 9th–10th segment, in females not reaching apex of elytra. Head with uneven punctation and very minute brownish hairs (appearing glabrous), only sometimes lateral to frons and on occiput with easily erasing white pilose speckles.
54 Frons broad, convex, with fine deep sparse punctation, laterally near anter-

ior angles emarginate, at posterior margin with highly produced lateral tubercles bearing antennal sockets. Sinciput compressed, with uneven, sometimes coarse punctation. Eyes barely convex, with only two–three rows of facets, interception between upper and lower ocular lobes narrow. Antennae longer than body, extending beyond apex of elytra by 9th–10th segment (male) or considerably shorter, extending only to posterior fourth of elytra (female). First antennal segment entire, thick, barely tapering toward base, longer than 3rd segment.

Pronotum transverse, apical width distinctly more than length, laterally with spiniform tubercle, uniformly tapering toward base and apex, disk moderately convex, with large striae, uneven or fine punctation, at posterior margin with smooth curved fringe. Pronotal shield flat, smooth, posteriorly broadly rounded or acute, almost triangular, laterally with gray hairs or without them.

Elytra comparatively elongate, gradually tapering toward apex, apically individually rounded, near humeral tubercles without perceptible notch, disk moderately convex, entire, with minute rugose punctation and minute brownish, barely perceptible (under high magnification) hairs, without longi-

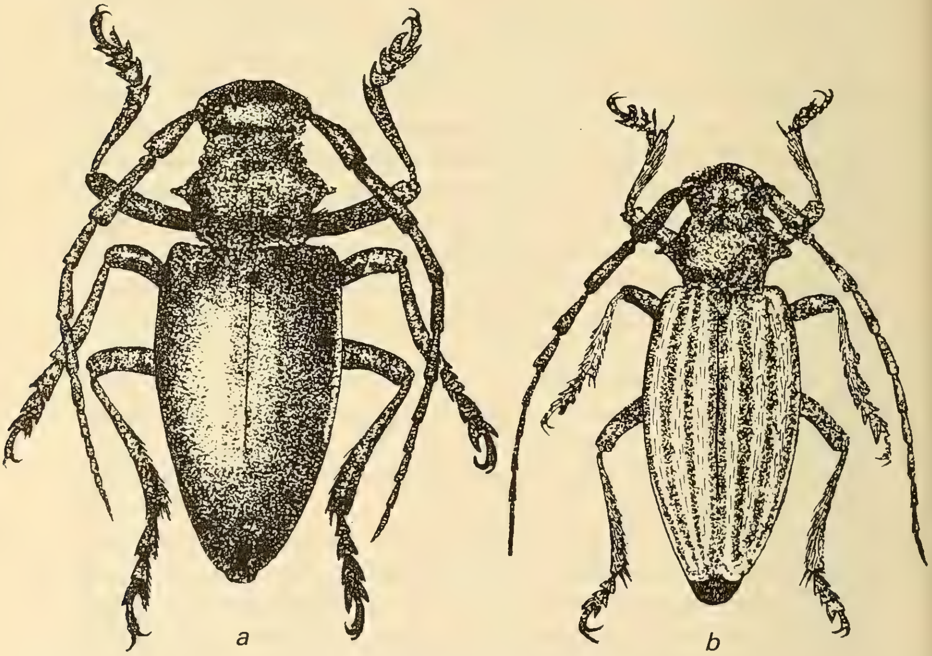

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Fig. 21. *Eodorcadion grumi* (Suv.).

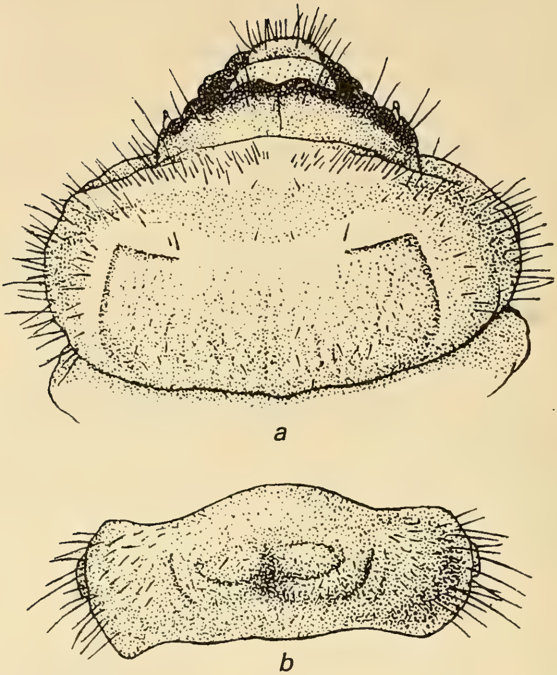
a—f. typica; b—m. *leucotaenium* (Suv.).

tudinal white pilose bands (f. typica), sometimes in females with four broad dense white pilose bands (m. *leucotaenium* (Suv.)), of which humeral band often longitudinally segregated. All these bands unite at apex, but sometimes second band from suture reduced, not extending to apex (ab. *imperfectotaenium* (Plav.)). Body ventrally with continuous white hairs, abdominal sternites often glabrous, only at posterior margin with white pilose fringe or white pilose speckles. Midtibiae on outer side in second half with broad notch covered with dense golden bristles forming brush. Body length 16–24 mm.

Egg: Elongate, slightly tapering toward caudal pole, at poles gently rounded, white, becoming brownish with time. Chorion with fine cellular sculpture imparting matte appearance. Length 4.0–4.5 mm, width 1.0–1.1 mm, weight 3.5–4.0 mg.

Larva (Fig. 22): Related to the group of species in which pronotal shield coriaceous, not sclerotized. Head in anterior half barely tapering, highly retracted into prothorax. Epistoma slightly convex, at anterior margin paramedially and at anterior angles with broad round projections, therefore appearing triemarginate here; moreover, medial notch narrow, lateral notches broad. Median longitudinal suture sharply expressed, dark brown, fringe at anterior margin of epistoma dark rust. Hypostoma almost five times wider than its medial length, anterior angles broadly rounded, disk perceptibly convex, reddish-rust, laterally much brighter. Clypeus lustrous, white, basally sometimes brownish, broad, occupies major part of anterior margin of epistoma, trapezoid. Labrum whitish, toward apex and basally brownish, convex, transverse, in anterior half with dense bright bristles. Mandibles elongate, on outer side with median transverse groove, basally black with reddish tone. Temporo-parietal lobes at anterior margin with dark brown fringe covering antennal sockets, in remaining part rusty, toward base much brighter, medially with barely perceptible setigerous pores in transverse row. Antennae conical, basally thick, their apices perceptibly projecting from antennal sockets.

Pronotum roundly tapering anteriorly, twice wider than long, highly sloping toward head, in anterior third (at hind margin of white fringe) with short, not very dense hairs forming transverse band, behind which smooth, lustrous, yellowish. Pronotal shield convex, coriaceous, not sclerotized, with punctures forming somewhat coarse longitudinal striae, laterally demarcated by short deep longitudinal grooves uniting anteriorly with transverse groovelike narrow yellowish notches extending inward and slightly inclined backward, with minute, barely perceptible bristles. Prothoracic presternum with short sparse hairs, laterally with glabrous rusty-yellow lustrous square. Eusternum convex, disk with lateral rusty hairs bent mediad, apically and basally glabrous.



54 Fig. 22. Larva of *Eodorcadion grumi* (Suv.).

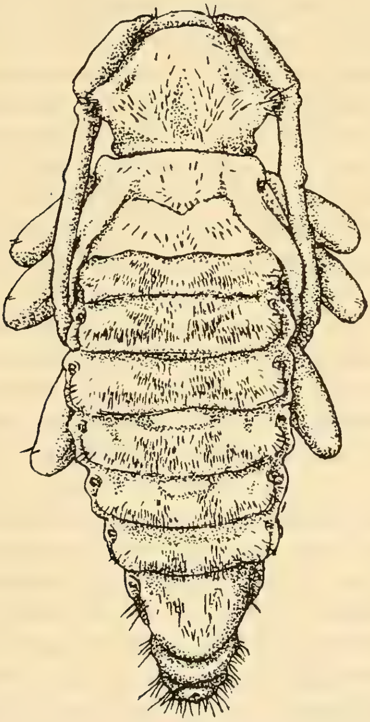
a—head and pronotum; b—abdominal tergite with dorsal locomotory ampulla.

Abdomen laterally with very thin, short dispersed (not dense) bright hairs. Dorsal locomotory ampullae moderately convex, divided by two transverse grooves, of which posterior groove more curved backward, with coarse striae forming barely perceptible granules. Abdominal tergites with individual, barely perceptible, bright hairs or without them around ampullae. Ventral locomotory ampullae with deep transverse groove, with oblique, elongate, foldlike granules arising from it. Abdominal tergite VIII in posterior half with minute thin hairs forming transverse band. Tergite IX in anterior half glabrous, in posterior half with sparse bright hairs. Abdominal sternites VIII–IX mostly glabrous, only with individual hairs not forming distinct cover. Body length of late instar larvae up to 25 mm, width of head up to 3.5 mm. In first instar larvae, anterior margin of epistoma with two sclerotized spinules that disappear after molt.

Pupa (Fig. 23): Characterized by large body, absence of transverse setigerous band at anterior margin of pronotum, and presence of sparse

56 bristles on meso- and metanota. Body massive. Head on occiput broadly rounded, sinciput compressed, near upper ocular lobes with individual bristles, near base of antennae convex, tubercular, inner to which with three–five bristles, in frontal region slightly convex, with narrow medial groove and dispersed bristles, at anterior margin near clypeus with paired bristles forming transverse row. Labrum apically with short lateral bristles. Antennae flexed laterad, in second half curved arcuately ventrad, here lying between mid- and hind tibiae.

Pronotum barely shorter than its basal width, disk convex, hind clivus with median longitudinal groove, laterally with large conically produced tubercle, inner to it with deep notch, in anterior half with sparse dispersed, in posterior half with dense bristles forming separate clusters. Lateral tubercles anteriorly glabrous, posteriorly with numerous bristles forming one cluster on each side. Mesonotum slightly convex, at posterior margin with barely produced shield, lateral to it with sparse bristles. Metanotum with median longitudinal, transversely flaring, troughlike groove, beyond middle with sparse bristles forming transverse band.



54 Fig. 23. Pupa of *Eodorcadion grumi* (Suv.).

Abdomen thick, barely tapering toward base, more so toward tip from segment IV. Abdominal tergites with narrow median longitudinal groove, in posterior half convex, here with dense rusty bristles forming broad continuous or medially narrowly interrupted transverse band, before middle with broad lateral notch, in anterior half with solitary bristles. Tergite VII convex, sometimes transversely produced, posteriorly narrowly rounded, with sparse or dense, unevenly dispersed bristles. Tergite VIII glabrous or with bristles in transverse row. Urogomphus at tip of abdomen (dorsal view) strongly recurved dorsad, terminally with barely perceptible sclerotized spinule, laterally with long rusty bristles on markedly or slightly produced sclerotized base. Tip of abdomen (ventral view) laterally bound by sharply projecting ridge covered with long dense rusty bristles. Valvifers of female lustrous, with very narrow interspace, compactly contiguous, apically with barely projecting tubercle. Body length 13–23 mm, width of abdomen 7–9 mm.

Material: Collected in Tuva (Ubsa-Nursk basin). Adults 121, larvae 44, pupae 5 males and females, larval and pupal exuviae with beetles from cells 2.

Distribution: Tuva, Mongolia, northwest China. In Tuva found in large numbers in southern part of Tannu-Ola ridge.

Biology: Belongs to the group of species inhabiting cereal-wormwood and desert feather grass-nanophytic steppes with sparse grass cover, mainly comprising *Diplachne*, *Stipa*, *Koeleria*, *Elymus*, and other species. Found on roadsides overgrown with *Agropyrum cristatum*, *Elymus ovatus*, and *E. junceus*. In 1976, large numbers were observed in Ubsa-Nursk basin in the region of Khol'-Ezhu, Akchara, and Ulatai.

Beetles appear in second half of June and are found up to August. In Tuva, we caught 68 beetles—5.7% in June, 93.2% in July, and 1.1% in August. Beetles feed on tissues of green leaves of cereal grasses and damage them from the margin. Females oviposit after mating. For this purpose, they first make an infundibular depression in the soil near the stem, then lay eggs near it in the soil or on the rhizome. They infest *Elymus*, *Agropyrum*, onion (*Allium mongolicum*), and possibly other herbaceous plants.

57 Hatching of larvae begins in July and is completed early September. Development of eggs from laying to hatching of larvae continues for 19–23 days (average 21.5 ± 0.2). We kept 55 eggs under observation. Larvae of mid- and late instars are found in the sod formed by grasses; they are rarely found beyond the limits of these sods. They feed on tissues of young rootlets and rhizomes mostly of growing cereal grasses, sometimes damage lower (green) part of fully grown stems. Therefore, the galleries made by larvae in the soil are sometimes packed with brown

frass with a greenish tone. Larvae of last instar make cell in the soil at a depth up to 10 cm and pupate in it. Length of cell up to 45 mm, width up to 12 mm.

Pupation begins by May-end or early June and is completed early July. Maximum pupae found in second half of June and generally not seen by mid-July. Pupal stage lasts about three weeks. For example, a pupa was formed on July 2nd and the beetle emerged from it on July 19th. Developed beetles rupture the upper wall of the cell and emerge on the soil surface; they require supplementary feeding. The weight of larvae before pupation varies from 349 to 768 mg (in individual cases up to 850 mg or more), of pupae from 320 to 730 mg, of beetles before emergence from cells from 268 to 615 mg. Generation—two-year cycle. Hibernation occurs in early or midstage larvae. In 1976 in early July in Ubsa-Nursk basin, we simultaneously found in the soil beetles, pupae, and larvae (solitarily) before pupation and larvae of midinstars awaiting second hibernation.

Eodorcadion grumi (Suv.) settles in colonies. It prefers rarefied, well-warmed grass covers. For example, in Ubsa-Nursk basin on alluvial soils with rarefied grass cover comprising *Elymus ovatus* (distance between plants 3–5 cm) on an area of 19.8 m^2, we found 40 individuals including 11 beetles, 5 pupae, and 24 larvae. All of them were found in the soil to a depth of 10 cm.

5. **Eodorcadion ptyalopleurum** (Suv.)

Suvorov, 1909, *Russk. entom. obozr.*, 9: 84 (*Neodorcadion*); —*multivittatum* Breuning, 1947. *Misc. Entom. Paris*, 43: 171; Plavil'shchikov, 1958. *Fauna SSSR*, 23, pt. 1: 462–463; Cherepanov and Cherepanova, 1978. *Takson. i ekol. chlenistonogikh Sibiri* (*nov. i maloizv. vidy fauny Sibiri*), 122–126.

Adult (Fig. 24): In general habits close to *E. grumi* (Suv.), but well distinguished from it by location of white hairs laterally on elytra, which form speckled discontinuous longitudinal belts. Head massive. Frons broad, convex, near eyes with projecting tubercle, medially with narrow, sometimes barely perceptible longitudinal groove, with deep or slightly fading punctation and barely perceptible brownish hairs. Genae in lower part with dense adherent white hairs. Sinciput and occiput with uneven, sometimes bold coarse punctation, medially with longitudinal groove or without it. Eyes broadly emarginate, cover base of frontal tubercles laterally. Antennae shorter (female) or longer (male) than body. First antennal segment almost parallel-sided, barely tapering toward base, apically on outer side with transverse ridge demarcating terminally a coarsely punctate square. Third segment shorter than 1st, slightly longer than 4th.

Pronotum in basal width slightly more (female) or not more (male) than length, laterally with acutely extended spiniform tubercle, disk convex, medially with longitudinal groove or without it, with compact, sometimes rugose punctation, with minute, barely perceptible hairs (at first glance
58 appearing glabrous). Pronotal shield flat, very broad, apically narrowly rounded or acute, laterally with dense or sparse gray adherent hairs.

Elytra distinctly elongate, gently tapering toward apex, apically individually rounded, disk convex, with oily sheen, with barely perceptible longitudinal ridge, with compact rugose punctation, with indistinct, short sparse brownish hairs, laterally with compact adherent hairs forming speckled (multiple) discontinuous longitudinal band (f. typica); sometimes similar, less distinct longitudinal bands present on spinal side of elytra (ab. *multivittatum* Breun.). Lateral bands near apex of elytra more enlarged. Body ventrally with white adherent pubescence. Abdominal sternite V elongate (female) or short (male), apically deeply emarginate (female) or truncate (male). Legs with dense white adherent pubescence; forelegs, especially mid- and partly hind tibiae on outer side (female) in second half

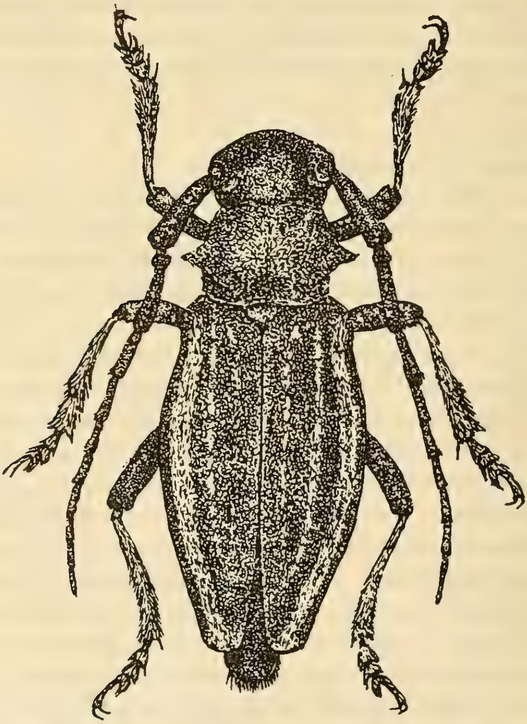


Fig. 24. *Eodorcadion ptyalopleurum* (Suv.).

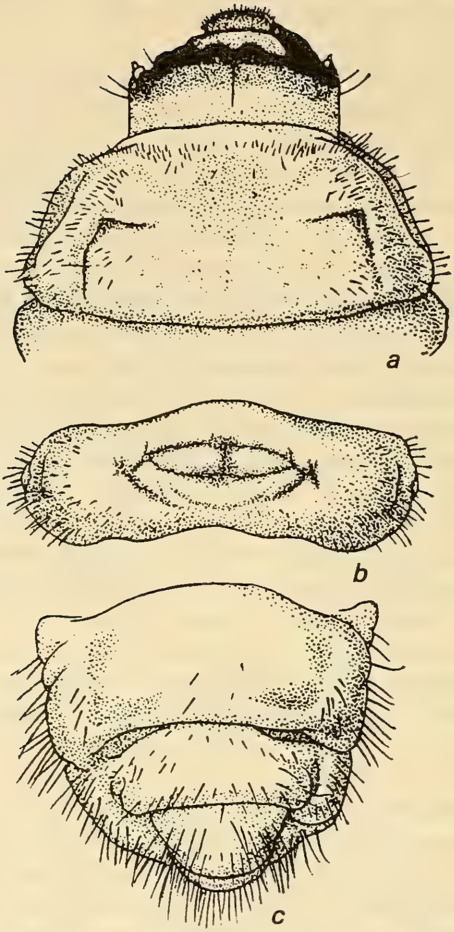
with dense yellowish bristles forming tuft, or only midtibiae on outer side with distal notch bearing dense tuft of yellowish bristles (male). Body, antennae, and legs black. Body length in males 14–19 mm, in females 18–23 mm.

Egg: Elongate, white, becoming brownish with time, broadly rounded at poles. Chorion with fine reticulate (or cellular) sculpture. Length 3.6 mm, width 1.0 mm, weight up to 2.5 mg.

Larva (Fig. 25): Readily recognized by round projections at anterior margin of epistoma, very sparse, barely perceptible pubescence on abdominal tergites (around locomotory ampullae appearing glabrous), and other characters. Head parallel-sided. Epistoma at anterior margin with large, roundly produced paramedial projections (disappearing with time, otherwise always perceptible), in between with dark brown fringe, as if narrowly incised, more rusty at posterior margin, here with minute setigerous pores in transverse row, medially with sharp longitudinal suture. Hypostoma four times wider than long (its anterior and posterior margins parallel), with narrowly rounded, almost straight anterior and highly produced, acute posterior angles, anteriorly rusty, transversely or obliquely striate, posteriorly much brighter and whitish laterally. Temporo-parietal lobes at anterior margin with broad brownish-rust fringe, behind which four long bristles in transverse row; posterior half of lobes glabrous, without bristles. Clypeus trapezoid, highly tapering anteriorly, lustrous, basally
59 with narrow brownish-rust fringe. Labrum transverse, three times wider than long, apically obtuse, anteriorly convex, whitish, with short dense rusty bristles, basally glabrous, with rusty fringe. Mandibles massive, at anterior margin obliquely truncate, black, only at base medially in region of broad trough with reddish-rust tone.

Pronotum roundly tapering anteriorly, sloping toward head, at posterior margin of anterior white fringe with short dense rusty hairs forming transverse band, behind which lustrous, rusty, with uneven, at places rugose punctation. Pronotal shield convex, lustrous, white, with deep setigerous uneven (anteriorly much larger, sparse) punctures, laterally demarcated by deep longitudinal grooves, which unite anteriorly with brownish transverse groovelike notch demarcating anterior angles of shield. Alar lobes with dense rusty hairs. Prothoracic presternum with short sparse bright hairs, laterally with lustrous triangular rusty-yellow spot. Eusternum convex, with short uniform, in front of base much longer dense hairs forming transverse band, basally glabrous, coriaceous, lustrous.

Abdomen laterally with short sparse rusty hairs. Dorsal locomotory ampullae convex, medially with longitudinal groove, with two transverse
60 grooves, of which anterior one generally straight, posterior one more backwardly curved; ridge between transverse grooves with minute striae, with-



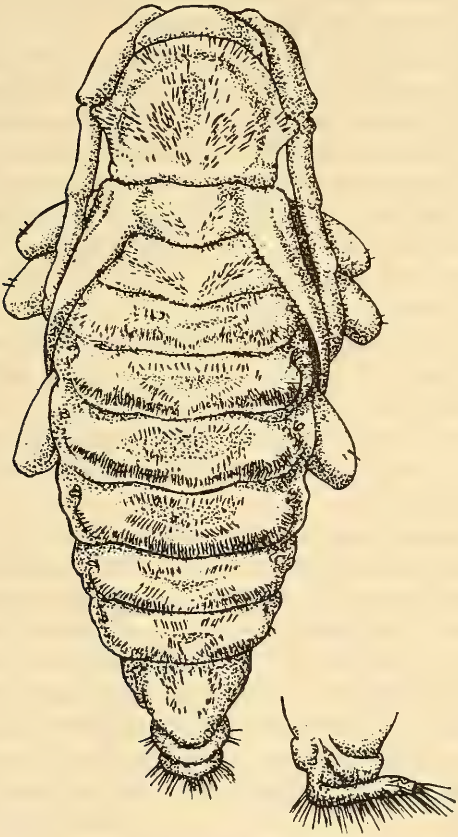
59 Fig. 25. Larva of *Eodorcadion ptyalopleurum* (Suv.).

a—head and pronotum; b—abdominal tergite with dorsal locomotory ampullae; c—tip of abdomen (ventral view).

out bristles. Abdominal tergites with short sparse hairs along sides of locomotory ampullae, in front and behind them with solitary, barely perceptible bright hairs or most often without them. Tergite VIII on disk in anterior half glabrous, laterally and beyond middle with thin hairs forming transverse band. Tergite IX laterally and in posterior third with long rusty hairs. Sternites VIII, IX glabrous, in posterior half with long sparse hairs forming distinct or indistinct transverse band or transverse row. Body length of late instar larvae up to 35 mm, width of head 3.8 mm.

Pupa (Fig. 26): Distinguished from the pupae of other species of the genus *Eodorcadion* Breun. By location of bristles on dorsal side of body. Head on occiput broadly rounded, on sinciput flatly compressed, inner to base of antennae highly convex tubercularly, here with deep median longitudinal groove, lateral to frons in front of antennae with acicular (situated in pairs or irregularly) spinules forming individual clusters. Labrum convex, near apex with group of short lateral bristles. Antennae in second half curved ventrad, their apices flexed toward body between mid- and hind tibiae.

Pronotum convex, smooth, laterally with produced tubercle, in anterior half with dispersed bristles not forming clusters, in posterior half on hind clivus with dense bristles forming two paramedial clusters, of which inner



59 Fig. 26. Pupa of *Eodorcadion ptyalopleurum* (Suv.).

cluster much larger than outer. Basally two small medial clusters of bristles occur, sometimes fusing anteriorly with inner clusters and forming with them two common bands diverging anteriorly. Lateral tubercles of pronotum with long dense rusty bristles. Mesonotum insignificantly convex, medially with barely perceptible longitudinal groove, at posterior margin with barely produced shield, lateral to it with dense bristles forming cluster or band extending obliquely from shield to anterior angle of elytra. Metanotum* transverse, medially with narrow longitudinal groove, with dense bristles forming transverse band interrupted medially and directed laterally and slightly forward.

Abdomen elongate, tapering almost from base toward tip, slightly curved dorsad, here with narrow median longitudinal groove. Abdominal tergites in posterior half convex, with dense bristles forming uniform, or near middle, enlarged band, before middle (especially laterally) with transverse notch, at anterior margin with bristles forming narrow transverse band or interlacing transverse row. Abdominal tergite VII tapering from base toward apex, apically rounded, disk convex, in anterior half (female) or paramedially almost over entire length (male) with long sparse rusty hairs. Tergite VIII glabrous, transverse, only laterally sometimes with long solitary bristles. Urogomphus at tip of abdomen broad, triangular (sometimes elongate, conical), laterally with long dense bristles on sclerotized base. Lateral ridges at tip of abdomen (ventral view) with long dense bristles on sclerotized base. Valvifers of female small, basally somewhat wide-set, apically with round tubercle, contiguous. Body length 17–24 mm, width of abdomen 6–8 mm.

Material: Collected in Tuvinsk basin in the western part of Chadansk Pass. Adults 49, pupae 5 males and 6 females, larval and pupal exuviae with beetles from cells 23.

61 *Distribution*: Tuva, in northern part of western Tannu-Ola from Chadansk Pass to Tela. Found in large numbers in valleys of the Chadan and Kemchik Rivers.

Biology: Inhabits steppes of the western regions of Tuvinsk basin. Infests plant associations of moderate density with abundance of *Agropyrum*, *Agrostis*, *Koeleria*, *Poa*, *Elymus*, *Stipa*, and other grasses growing on chestnut-colored soils and in the south on shallow chernozem soils.

Often found in well-defined colonies. Beetles appear on the soil surface in early July; maximum numbers observed during middle (second ten days) of this month, disappear mid-August. Feed on green leaves of cereal grasses and nibble deep notches in them from the margin. Females oviposit in the axil of leaves of underground part of the stems of *Agrostis*,

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*Erroneously given as "mesonotum" in Russian original—General Editor.

Agropyrum, and other cereal grasses. Fecundity comparatively high. On dissecting a female which had not yet started oviposition, we found 32 eggs in the ovaries, in another 25, and still another 37. Egg development lasts 17 to 21 days (average 17.8 ± 0.1). In individual cases, development is prolonged up to four weeks.

Hatching of larvae begins in August and concludes in September. Larvae live in the soil pierced by roots and rhizomes of cereal grasses, feed on the plant tissues, and often damage underground parts of stems. Larvae of last instar, after their second hibernation, make cells for pupation in the soil at a depth up to 5.0 cm. Length of cells 23–30 mm, width 8–10 mm.

Pupation takes place from June-end to middle of last ten days of July. Pupal stage lasts two, rarely three weeks. Developed beetles emerge from the cells onto the soil surface mostly in July, partially in the first half of August. Generation—two-year cycle. Based on 27 individuals, larvae preparing for pupation weigh 267–846 mg (483.8 ± 26.8), pupae 246–771 mg (424.5 ± 24.8), beetles before emergence from cells 190–480 mg (323.7 ± 18.1). During metamorphosis the weight reduces, on average, by 33.1%. Individuals weigh up to 1,020 mg in the larval stage, 905 mg in the pupal stage, and up to 543 mg in the adult stage.

In diggings done in the outskirts of Chadansk experimental station, up to two, rarely three larvae were found per square meter in the soil. They were mostly found in the sod zone of *Agropyrum cristatum*, *Elymus* sp., and other cereal grasses.

6. **Eodorcadion leucogrammum** (Suv.)

Suvorov, 1909. *Russk. entom. obozr.*, 9: 82 (*Neodorcadion*); Plavil'shchikov, 1958. *Fauna SSSR*, 23, pt. 1: 457–458; —*tuvense* Plavilstshikov, 1958. *Ibid.*, 451–453; Cherepanov and Cherepanova, 1978. *Takson. i ekolog. chlenistonogikh Sibiri* (*nov. i maloizv. vidy fauny Sibiri*), 127–131.

Adult (Fig. 27): Similar to *E. grumi* (Suv.) and *E. ptyalopleurum* (Suv.). Distinguished from them by less produced frontal tubercles at base of antennae, sparse pubescence on lower side of genae, short antennae, location of pubescence on elytra, and other characters. Head broad with sparse, very minute hairs. Frons convex, with deep bold or slightly evanescent punctation, medially with narrow longitudinal groove or without it, near anterior angles with deep oblique lateral incision (notch) and hence anterior angles of frons appear acutely produced laterally. Genae, on lower side, and temples glabrous or with sparse hairs not forming continuous compact pubescence. Sinciput and occiput with deep bold, sometimes uneven punctation. Antennae extending up to middle third of elytra (female) or barely extending up to elytral apices (male). First antennal segment barely tapering toward base, with minute punctation, apically on outer side with

62 small setigerous square (bristles short, coarse, dark brown) demarcated by semicircular ridge. Third segment longer than 4th, but shorter than 1st.

Pronotum barely transverse, laterally with spiniform tubercle, disk convex, with bold striae or comparatively minute punctation, medially with distinct or faint longitudinal groove, with short sparse compact adherent brownish hairs not forming compact pubescence. Pronotal shield flat, small, semicircular, with sparse or somewhat dense minute punctation, laterally with sparse brownish or comparatively dense white hairs, sometimes glabrous.

Elytra slightly elongate, in anterior third insignificantly expanded, apically individually broadly rounded, near humeri sometimes slightly compressed, disk moderately convex, with compact minute, sometimes striate punctation, with short, uniformly distributed, adherent brownish hairs, with narrow, longitudinal white pilose bands fusing at apex (f. typica) or inner spinal band terminating freely, not extending to apex (ab. *emancipatum*

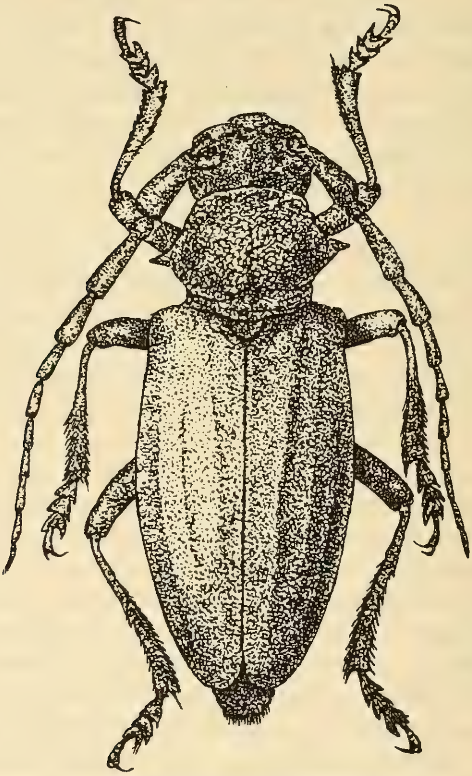


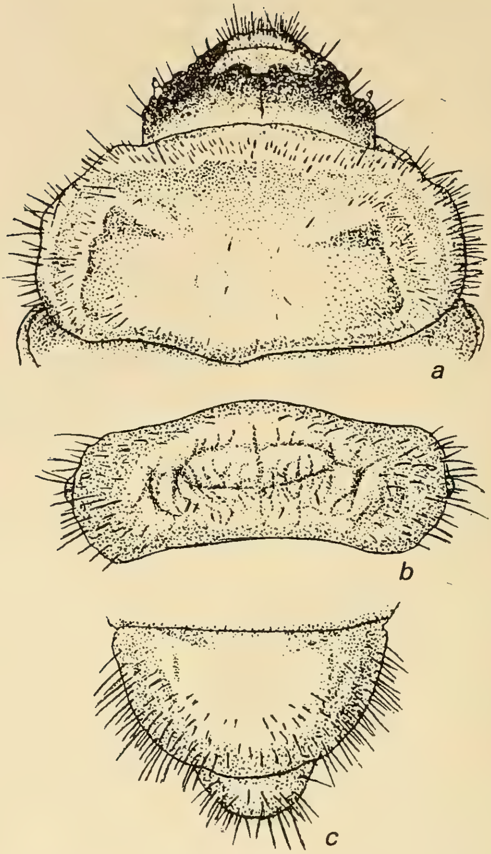
Fig. 27. *Eodorcadion leucogrammum* (Suv.).

Plav.) or all longitudinal bands not reaching apex and terminating freely (m. *semivirgulatum* Plav.) or longitudinal white bands absent and only uniformly distributed, short brownish, yellowish or grayish hairs present (ab. *tuvense* Plav.). Body ventrally with sparse (in thoracic region much denser) gray hairs. Sternite V apically slightly emarginate or broadly rounded. Legs with sparse brownish hairs not forming compact pubescence. Midtibiae on outer side in distal half with distinct notch bearing brush of dense golden bristles. Body length 14–24 mm.

Egg: White, elongate, toward one pole more, toward the other less or uniformly tapering, at poles rounded. Chorion with fine reticulate-cellular sculpture. Length 3.0–4.1 mm, width 0.9–1.1 mm, weight 1.3–1.9 mg.

Larva (Fig. 28): Well distinguished from the larvae of *E. ptyalopleurum* (Suv.) and *E. grumi* (Suv.) by broad triangular notches on pronotum, location of hairs on eusternum, and other characters. Head transverse, parallel-sided. Epistoma in anterior half insignificantly convex, apically flat or slightly compressed, at anterior margin with two broad round paramedial projections (with time, these projections disappear to a great extent), with broad dark brown, posteriorly rusty fringe, behind brown part of fringe with long paired bristles forming transverse row, medially with longitudinal suture, more distinct in anterior half. Hypostoma almost five
63 times wider than long, medially convex, transversely striate, at anterior angles gently rounded, brownish-rust, only in region of posterior angles whitish. Temporo-parietal lobes at anterior margin with brownish-rust fringe covering antennal sockets, behind fringe with solitary bristles in transverse row. Antennae whitish or brownish, their apices projecting beyond anterior margin of head capsule. Clypeus large, lustrous, whitish, basally with narrow brownish band or without it. Labrum broad, apically broadly rounded, in anterior half whitish, convex, with dense rusty bristles, basally glabrous, brownish-rust. Mandibles elongate, apically obliquely truncate, black, in posterior half reddish-rust, on outer side with median transverse groove.

Pronotum transversely oval, tapering more anteriorly, in region of white fringe at anterior margin with dense rusty hairs forming transverse band, with two angular projections posteriorly. Behind band in front of shield and laterally, pronotum lustrous, yellowish-rust. Pronotal shield white, coriaceous, convex, with deep rugose punctures, with short solitary bristles, laterally demarcated by short, slightly outcurved grooves uniting anteriorly with triangular transverse rusty-brown notches. Alar lobes with rusty
64 hairs forming longitudinal band extending anteriorly beyond transverse notch of shield. Prothoracic presternum with short, on disk much sparser hairs, laterally with an extensive lustrous rusty spot. Eusternum apically and basally glabrous, medially with thin, comparatively dense hairs forming transverse band. Meso- and metasterna with deep medial transverse



63 Fig. 28. Larva of *Eodorcadion leucogrammum* (Suv.).

a—head and pronotum; b—abdominal tergite with dorsal locomotory ampulla; c—tip of abdomen (dorsal view).

groove, before it with short rusty setiform hairs forming narrow transverse band.

Abdomen thick, massive, laterally with sparse rusty hairs. Dorsal locomotory ampullae moderately convex, medially with narrow longitudinal groove, with two transverse grooves uniting laterally at an acute angle, the transverse ridge between them striate, without bristles. Abdominal tergites in front and behind locomotory ampullae without hairs, glabrous. Ventral locomotory ampullae divided medially by transverse groove, with deep striae arising from it longitudinally (slightly obliquely) elongate, before it with short hairs forming narrow transverse band, behind it with solitary hairs or more often without them. Tergite VIII glabrous, only beyond middle with short thin hairs forming faint transverse band. Tergite IX, in posterior half and laterally sparsely pilose, on disk and basally glabrous. Body length of late instar larvae 16–28 mm, width of head up to 3.8 mm. First instar larvae with one spinule on outer side of mandibles, two spinules at anterior margin of epistoma, and four spinules at anterior margin of hypostoma. These spinules disappear after molt.

Pupa (Fig. 29): In general features, very similar to the pupa of *E. ptyalopleurum* (Suv.). Distinguished from it by absence of bristles anterior to lateral tubercles of pronotum and location of bristles on abdominal tergites. Body massive, curved dorsad. Head on occiput broadly rounded, sometimes with projecting paramedial tubercles, on sinciput compressed, near upper ocular lobes with one or three bristles or without them; between antennal bases with broad longitudinal trough, near (slightly before) them

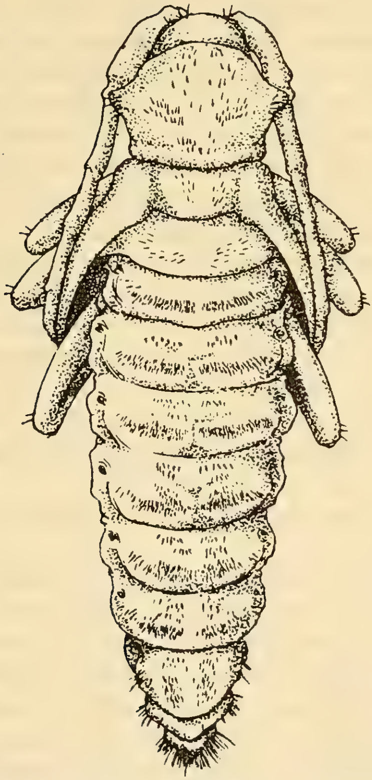


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Fig. 29. Pupa of *Eodorcadion leucogrammum* (Suv.).

with individual bristles forming cluster or transverse row, in anterior half of frons with bristles forming lateral cluster, near clypeus with three–four bristles forming transverse row. Labrum apically with short bristles. Antennae in second half curved ventrad.

Pronotum transverse, laterally with large produced tubercle (which is glabrous anteriorly and with rusty hairs posteriorly), disk convex, at base of lateral tubercles without notch, in anterior half with sparse dispersed bristles, on hind clivus lateral to (barely perceptible) median longitudinal groove with dense bristles forming four clusters, of which inner ones large, laterally elongate, outer ones small, slightly elongate or not elongate, their interspace with solitary wide-set bristles. Mesonotum posteriorly with barely curved or not curved shield, insignificantly convex, with a few paramedial bristles forming band that extends obliquely toward base of elytra or forms small cluster. Metanotum with narrow median longitudinal groove, in posterior half with short bristles forming narrow transverse band.

Abdomen toward base insignificantly, toward tip notably tapering and curved dorsad. Abdominal tergites in posterior half highly convex, here on raised part with dense rusty bristles forming transverse band, medially with narrow longitudinal groove, in anterior half with sparse bristles forming transverse, sometimes interlacing row, or without bristles. Tergite VII
65 apically rounded, disk convex, lustrous, in anterior half glabrous or with minute solitary, in posterior half dense rusty bristles forming two longitudinally extended clusters. Tergite VIII with very minute solitary bristles forming transverse row. Urogomphus at tip of abdomen short, thick, terminally obtusely rounded, with long dense bristles on sclerotized base. Ridges at tip of abdomen (ventral view) large, with dense bristles. Valvifers of females very small, hemispherical, contiguous. Body length 16–25 mm, width of abdomen 7–8 mm.

Material: Collected in Tuva, in region of the Ulug-Khemsk basin. Adults 392, larvae 103, pupae 11 males and 12 females, larval exuviae with beetles from cells 11.

Distribution: Steppe regions of upper Yenisey River. Known to us only from Tuva.

Biology: Inhabits cereal grasses, cereal-wormwood-pea shrub steppes of foothill and fluvial regions mostly in the central part of the Ulug-Khemsk basin in the eastern part of Chadansk Pass. Distributed in colonies infesting plant associations with abundance of *Agropyrum*, *Koeleria*, *Stipa*, *Diplachne*, *Elymus*, at places *Carex*, and others. Beetles appear by June-end and are found up to mid-August. Maximum number observed in July. For example, during 1947–1949 in systematic collections during the season, 263 beetles were caught—4.6% in June, 74.1% in July, and 21.3% in

August. Beetles often climb on plants and feed on green tissues of the leaves of cereal grasses, nibbling them from the margin. They sometimes damage green stems. Their gonads mature during this period. On dissection of mature females, 24 eggs were found in the ovaries of one and 30 in another.

After mating, the female oviposits. For this purpose, she makes an infundibular depression in the soil near a stem, laying bare its underground part, then using her mandibles nibbles a cavity in the stem, introduces her ovipositor into this cavity, and lays an egg. Sometimes two–three eggs are laid through one and the same cavity in a stem. Stems of growing plants of *Agropyrum* and other cereal grasses are infested.

Larvae hatch from the eggs three–four weeks after oviposition; egg development is considerably delayed in too moist soil. The developed larva breaks the chorion, emerges, makes a longitudinal gallery in a rhizome, and feeds on its tissues. Larvae of mid- and late instars live in the soil by the roots of cereal grasses, feed on their tissues, and sometimes nibble the underground and basal parts of the stems. They are found mainly on virgin and long-fallow lands and rarely colonize cultivated lands. The density of larval population in the soil is comparatively low. Within the limits of distribution of the colonies, we found two–four larvae per square meter of soil.

Larvae of the last instar, after the second hibernation, make cells horizontally in the soil at a depth of 2–5 cm or more, but more often the cells are inclined at an angle of 45°. Length of cell 23–30 mm, width 9–15 mm. Pupation begins in the first ten days of June and is completed early July. Maximum pupae observed June-end and none seen during the last ten days of July. In nature, the pupal stage lasts two–three weeks, on average, 17–18 days.

Young beetles appear in the second half of June and in July, remain in the cells up to seven days, then emerge on the soil surface, and soon

66 **Table 7. Change in weight (mg) of *Eodorcadion leucogrammum* (Suv.) during metamorphosis**

Stage	No.	Min.	Max.	M ± m	%
			Males		
Larval	23	158	503	349.6 ± 16.5	100.0
Pupal	23	145	412	317.5 ± 13.0	90.8
Adult	23	125	352	248.3 ± 10.4	70.7
			Females		
Larval	20	367	901	499.6 ± 28.6	100.0
Pupal	20	337	827	462.3 ± 27.3	92.5
Adult	20	290	636	377.4 ± 20.5	75.5

thereafter climb plants and start feeding. They live up to three–four weeks. Generation—two-year cycle. Weight of larvae before pupation 158–901 mg, pupae 145–827 mg, beetles before emergence from cells 125–636 66 mg. Females are markedly larger than males (Table 7). Furthermore, the comparative weight reduction indices during metamorphosis are lower in females than in males.

7. **Eodorcadion quinquevittatum** (Hamm.)

Hammarström, 1893. *Öfv. Finska Vet. Soc. Förhl.*, 34: 192 (*Neodorcadion*); Plavil'shchikov, 1958. *Fauna SSSR*, 23, pt. 1: 453–455; Cherepanov and Cherepanova, 1978. *Takson. i ekolog. chlenistonogikh Sibiri* (*nov. i maloizv. vidy fauny Sibiri*), 131–135.

Adult (Fig. 30): Characterized by black body and distinctly projecting, compact longitudinal white pilose bands on black background of elytra. Body slightly elongate. Head with deep dense, sometimes uneven or slightly erased punctation; on genae with dense, in remaining part with sparse specklike white hairs. Sinciput compressed, frons convex, with narrow median longitudinal groove and produced anterior angles. Antennae short, extending up to hind clivus of elytra (female) or comparatively long, extending beyond elytral apices by 10th segment. First antennal segment slightly tapering toward base, with compact punctation, apically on outer side with ridge demarcating small semicircular mark terminally.

Pronotum on disk convex, near apex and basally with barely perceptible flange, with coarse uneven striate punctation, medially with smooth narrow longitudinal groove, rarely without groove, laterally with small tubercle (produced into long thin spinule terminally), before middle and basally with pair of small white hairs, easily erasing spots, near base of lateral tubercles with compact adherent white hairs forming here one white spot. Pronotal shield triangular, broad, medially smooth, glabrous, apically narrowly rounded, laterally with dense adherent white hairs.

Elytra oval, posteriorly more elongate, tapering toward base and apex, disk moderately convex, near humeri with deep (female) or barely perceptible (male) longitudinal dent, with compact longitudinal uniform white pilose bands, between these bands smooth, with barely perceptible, erased punctures, with short brownish hairs visible only under high magnification. Each elytron with five longitudinal bands—one marginal band terminating freely, two humeral, and two spinal bands that fuse in pairs at apex (f. typica). Sometimes these paired bands fuse additionally with marginal band (ab. *multiconjugatum* Plav.) or outer spinal band (second from suture) 67 short, terminating freely (ab. *subconjugatum* Plav.) or both spinal bands short (ab. *semiexolutum* Plav.); sometimes humeral bands reduced anteriorly and not fused here (ab. *semidissociatum* Plav.). Body ventrally with

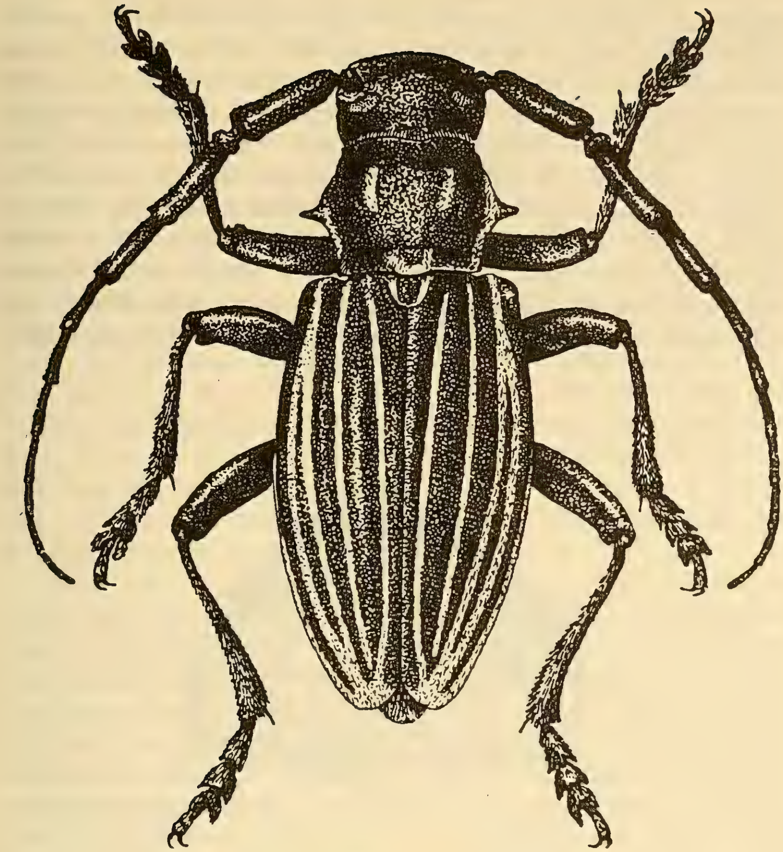

Fig. 30. *Eodorcadion quinquevittatum* (Hamm.).

dense compact adherent white pubescence. Legs with uneven gray pubescence. Midtibiae in distal half on outer side in males with deeper, in females with less deep notch bearing dense bristles forming brush. Body, antennae, and legs black. Body length 14–24 mm.

Egg: White with brownish tinge, elongate, broadly rounded at poles. Chorion with very fine cellular sculpture. Length 3.0–4.2 mm, width 0.9–1.1 mm, weight 4–5 mg.

Larva (Fig. 31): Characterized by broadly rounded to hemispherical projections at anterior margin of epistoma, white coriaceous shield of pronotum, and pubescence in anterior half of eusternum. Body thick. Head transverse, parallel-sided, highly retracted into prothorax. Epistoma at anterior margin with two large round projections, with produced anterior angles,

with black or dark brown fringe, behind it with rusty-white tone gradually passing over toward apex, medially in anterior half with more, in posterior half with less distinct longitudinal suture, with wide-set bristles forming two transverse rows. Hypostoma with rounded anterior and acutely curved posterior angles, almost five times wider than long, medially perceptibly convex, with striae extending obliquely forward and toward sides from middle, reddish-rust, at posterior angles whitish. Temporo-parietal lobes
68 at anterior margin with dark brown fringe, behind it rusty, here with setigerous pores in transverse row, in posterior half much brighter. Antennal apices barely projecting beyond anterior margin of cephalic capsule. Clypeus large, trapezoid, with base extending laterally almost up to anterior angles of epistoma, brownish. Labrum almost four times wider than long, at anter-

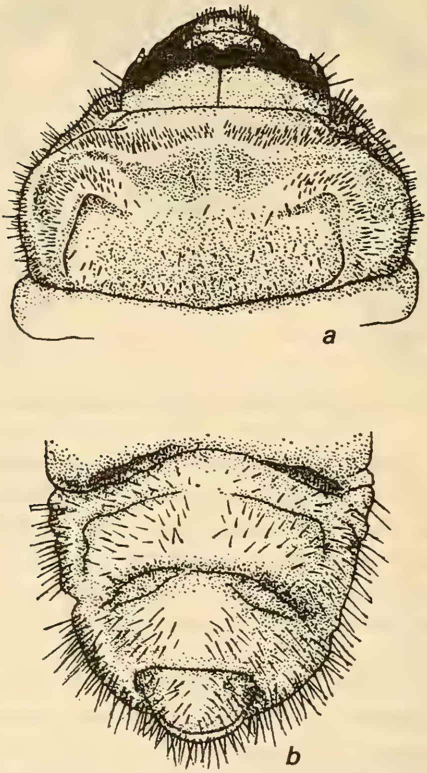

Fig. 31. Larva of *Eodorcadion quinquevittatum* (Hamm.).
a—head and pronotum; b—tip of abdomen (ventral view).

ior margin gently rounded, whitish, almost throughout entire surface with dense rusty bristles, basally with brownish-rust fringe. Mandibles massive, apically obliquely truncate, on inner side with obtuse ridge extending transversely from upper margin toward lower denticle, on outer side with medial, girdling, transverse groove, black, basally reddish.

Pronotum twice wider than long, at anterior margin with broad white fringe, here with dense rusty hairs forming transverse band (with one angular paramedial projection at posterior margin), behind this belt with yellowish glabrous lustrous square passing over to sides beyond longitudinal pilose band on alar lobes. Pronotal shield white, coriaceous, not sclerotized, moderately convex, with deep punctures and sparse bristles, medially with narrow longitudinal groove, laterally demarcated by short longitudinal grooves uniting anteriorly with brownish transverse notch. Alar lobes whitish, with sparse/dense hairs forming longitudinal band passing over anteriorly to transverse notch. Prothoracic presternum with short, in comparison with other species, much denser rusty hairs, laterally 69 with large glabrous lustrous yellow spot. Eusternum convex, in anterior half with numerous short, beyond middle much longer rusty hairs, here forming transverse band, basally glabrous.

Abdomen thick, laterally with short dense rusty hairs. Dorsal locomotory ampullae divided by narrow median longitudinal groove and two transverse grooves demarcating transverse, laterally acute, fine, almost granular, striate ridge bearing three barely perceptible paramedial bristles forming transverse row; sometimes these bristles are absent. Abdominal tergites with short rusty hairs around locomotory ampullae. Ventral locomotory ampullae divided by deep transverse groove with striae arising from it and forming longitudinally, slightly obliquely extended granules. Abdominal sternites with numerous short rusty hairs around locomotory ampullae. Tip of abdomen with much longer, thin rusty hairs. Body length of late instar larvae 20–32 mm, width of head 3.5–4.0 mm. First instar larvae with one acute spinule each on outer side of mandibles, two large spinules at anterior margin of epistoma, four paired spinules at anterior margin of hypostoma and one large spinule at anteroventral margin of temporoparietal lobes.

Pupa (Fig. 32): Similar to the pupa of *E. leucogrammum* (Suv.). Distinguished from it by sclerotized apex of urogomphus at tip of abdomen. Head on occiput broadly rounded, on sinciput flat or perceptibly compressed, laterally near upper ocular lobes with one–two bristles, between antennal bases with broad longitudinal trough, anterolateral to them with large bristles forming individual clusters, at base of clypeus with paired lateral bristles forming transverse row. Labrum apically glabrous, lustrous, mediolaterally with short bristles forming one small cluster on each side.

Antennae in second half on ventral side bend arcuately (female) or semicircularly (male).

Pronotum convex, anteriorly more sloped, with distinct median longitudinal groove, anteriorly with more, posteriorly with slightly less conically extended tubercle, in anterior half with sparse, uniformly dispersed bristles, hind clivus with dense hairs that form two narrow bands diverging from base and one small lateral cluster. Interspace between this lateral cluster and band broader than band itself. Lateral tubercles glabrous in front, in posterior half with bristles. Mesonotum in posterior half transversely compressed, at posterior margin with angularly produced or rounded shield, laterally with minute bristles forming one cluster on each side, in front of anterior notch with bristles forming an interlacing row. Metanotum medially with longitudinal groove, in posterior half with bristles forming transverse band.

Abdomen barely tapering toward base, gently and significantly toward

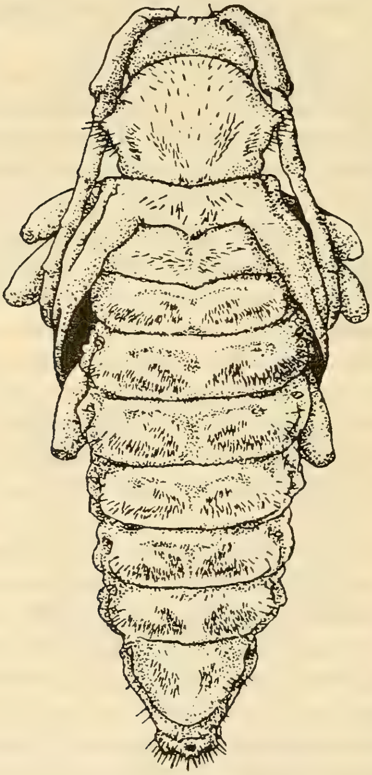

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Fig. 32. Pupa of *Eodorcadion quinquevittatum* (Hamm.).

tip. Abdominal tergites in posterior half convex, here with dense rusty hairs (forming transverse band with medial interruption and deep oblique notch on disk), in anterior half with distinct transverse notch, in front of it with individual or numerous bristles or without them, medially with common longitudinal groove. Tergite VII transverse or perceptibly elongate, apically rounded, laterally with not very long rusty bristles forming two longitudinally extended, rarefied or dense clusters. Tergite VIII with individual bright bristles forming transverse row. Urogomphus at tip of abdomen terminally spiniform, sclerotized, laterally with long dense rusty
70 bristles lacking distinct sclerotized base. Ridge at tip of abdomen (ventral view) with numerous thin bristles on sclerotized base or here often without sclerotization. Valvifers of female somewhat wide-set, contiguous, apically with tubercular projection. Body length 16–25 mm, width of abdomen 6–8 mm.

Material: Collected in Tuva (Ulug-Khemsk basin). Adults 385, larvae 74, pupae 5 males and 3 females, larval exuviae with beetles from cells 3.

Distribution: Tuva from Kaa-Khema River to Kemchik River. More abundant in the Ulug-Khemsk basin. There are reports (Plavil'shchikov, 1958) of its occurrence in the southern part of Krasnoyarsk territory (western Sayans) and in the Ubsa-Nursk basin (southern part of Tannu-Ola).

Biology: Inhabits wormwood-cereal, grassy and cheegrass (*Lasiogrostis* sp.) steppes. Preferentially infests fields covered with cereal grasses such as *Stipa*, *Elymus*, *Koeleria*, *Diplachne*, *Festuca*, and others. Often forms large colonies on unflooded fluvial terraces overgrown with *Lasiogrostis splendens*. Beetles crawl from the last ten days of June to mid-August. Maximum number observed in July. Climb stems of *Lasiogrostis*, pea shrub, and other plants. During the summer season of 1947–1949 in the Ulug-Khemsk basin, we collected 337 beetles—5.0% in June, 80.7% in July, and 14.3% in August. Beetles require supplementary feeding, damage green leaves of cereal grasses, and live up to four weeks. Females lay eggs in leaf axil in the basal underground part of stems of feather grass and other cereal grasses. Larvae hatch from laid eggs after 2.0–2.5 weeks. For example, under laboratory conditions simulating natural, beetles laid 128 eggs and larvae hatched from them 14–24 days later (average, 15.8 ± 0.2). Larvae live for about two years, make galleries in the soil, remain mostly in sods, and damage roots and underground parts of stems. Larvae of the last instar, after the second hibernation, live in the soil, often under roots of cereal grasses or in sods, make pupal cells and pupate in them the same summer. Length of cell 15–30 mm, width 6–12 mm.

Pupation begins in the first half of June and is completed in July. Maximum pupae found toward middle of first ten days of July. Pupal stage lasts two–three weeks. For example, in field experiments, one pupa developed in 14 days, another in 16 days, and two others in 20 days.

Young beetles appear during the last ten days of June and in July. Developed beetles emerge from the soil with underdeveloped gonads. Soon after emergence from the soil they start feeding. Generation—two-year cycle. Based on 28 individuals (males and females), weight of larvae before pupation in cells 281–734 mg (502.2 ± 21.7), pupae 256–654 mg (431.8 ± 21.6), beetles before emergence from cells 206–534 mg (334.7 ± 20.8). Weight reduction in the insects during metamorphosis is about 33.4%.

In 1970, digging was done near the town of Kyzyl' where, from 200 m^2 of soil, we collected one pupa, one beetle, and 54 larvae and, at another place, in 22 m^2—five larvae. The larvae were mainly found in sods.

8. **Eodorcadion brandti** (Gebl.)

Gebler, 1841. *Bull. Soc. Nat. Mosc.*, 14: 610 (*Dorcadion*); Plavil'shchikov, 1958. *Fauna SSSR*, 23, pt. 1: 465–467.

Adult: Distinguished from all other species of the genus *Eodorcadion* Breun. by large body, variegated antennae, and broad white longitudinal
71 bands on elytra. Head with uneven punctation, medially on sinciput and frons with longitudinal groove. Antennae extending beyond apex of elytra (male) or distinctly not reaching it (female); segments basally with white rings. First antennal segment with transverse, angular, sharply distinct apical ridge demarcating small, angularly expanded terminal square.

Pronotum transverse, convex, medially with one smooth longitudinal band, here with groovelike longitudinal trough, along its sides with dense white pilose spot, with uneven, comparatively dense striate punctation, laterally with gently produced tubercle with thin or thick apical spinule. Pronotal shield broad, posteriorly broadly rounded, laterally with dense compact adherent hairs.

Elytra insignificantly enlarged medially toward base, roundly tapering toward apex, apically with narrowly rounded inner angle, disk convex, with longitudinal ridges; humeral ridge basally serrate, extending almost up to apex. Between ridges lie broad compact longitudinal white pilose bands, of which marginal band the broadest, occupying almost entire space between humeral ridge and epipleuron, inner spinal band basally terminating freely, apically fusing with humeral band and then through it with marginal band; outer spinal band basally and apically fusing with humeral band (f. typica) or apically terminating freely (ab. *nigrolineatum* Reitt.). Body ventrally with compact gray or white pubescence. Legs with compact yellowish-white pilose cover; midtibiae on outer side in second half with broad notch bearing dense brush of yellowish bristles. Body length (male and female) 20–29 mm.

Material: Described on the basis of collections preserved in the Zoological Institute (Leningrad) and in the Zoological Museum, Moscow State University.

Distribution: Northeast Kazakhstan, Altai (from the horn of Chuisk ridge). Occupies montane steppes. Beetles are found from June-end to August.

Biology: Not studied. Preimaginal stages not known.

26. Tribe LAMIINI

Adults: Characterized by thick antennae highly tapering toward apex. First antennal segment with well-developed cicatrix. Pronotum laterally with large spiniform, acutely produced tubercle. Elytra at humeri broader than base of pronotum, without longitudinal ridges, basally with granular punctation. Hind membranous wings well developed (*Lamia* F., *Lamiomimus* Kolbe) or rudimentary (*Morimus* Serv., *Dorcatypus* Thoms.).

Larvae: Body thick. Pronotal shield sclerotized, yellowish-rust, at anterior angles sharply emarginate, laterally demarcated by longitudinal grooves. Thoracic legs absent. Dorsal and ventral locomotory ampullae sclerotized, with flat, sometimes faint granules. Anal pore transverse.

Pupae: Distinguished by massive stocky body. Antennae in second half arcuate, their apices flexed ventrad. Pronotum laterally with large, conically produced tubercle. Abdomen generally enlarged medially, at tip with long urogomphus demarcated by sclerotized spinule. Abdominal tergites at posterior margin with long acicular bristles forming transverse band.

72 Three genera of the tribe Lamiini are known in the fauna of the Soviet Union, of which two inhabit northern Asia. In morphological characters, the genus *Lamiomimus* Kolbe is closer to the genus *Lamia* F. and shares common historical links with it. Were this not so, it would be difficult to explain the existing homogeneity in structure of the anus of the larvae and other morphological characters in the various developmental stages of both genera.

KEY TO GENERA

Adults

1 (2). Antennae extending beyond middle or barely up to posterior third of elytra. . . . . **1. Lamia** F.

2 (1). Antennae extending up to apex of elytra or slightly beyond it. . . . . **2. Lamiomimus** Kolbe

Larvae

1 (2). Anterior groove of ventral locomotory ampullae of abdominal sternites V–VII straight. . . . . 1. **Lamia** F.
2 (1). Anterior groove of ventral locomotory ampullae of abdominal sternites V–VII distinctly curved backward. . . . . 2. **Lamiomimus** Kolbe

Pupae

1 (2). Abdominal tergites I–IV in posterior half with dense bristles forming broad transverse band; tergites V–VII with sparse bristles forming two small clusters. . . . . 1. **Lamia** F.
2 (1). Abdominal tergites I–III in posterior half with dense bristles forming broad transverse band; tergites IV–VII with sparse bristles forming transverse row. . . . . 2. **Lamiomimus** Kolbe

1. Genus *Lamia* F.

Fabricius, 1775. *Syst. Entomol.*, 175; Plavil'shchikov, 1958. *Fauna SSSR*, 23, pt. 1: 497–498; Mamaev and Danilevskii, 1975. *Lichinki zhukov-drovosekov*, 230–231.

Adult: Body thick, stocky, with minute adherent yellowish-golden hairs imparting bronze tone. Antennae shorter than body, extending beyond middle of elytra. Elytra on disk in anterior half with smooth black grains.

Larva: Characterized by thick body. Head parallel-sided, highly retracted into prothorax. Pronotal shield sclerotized, at anterior angles with rectangular notch. Dorsal locomotory ampullae divided by two transverse grooves that merge laterally. Ventral locomotory ampullae divided by straight transverse groove.

Pupa: Body thick. Head short, broad. Frons broad, laterally with long spinules. Labrum along margins with dense acicular bristles forming broad semicircular band. Antennae in second half arcuate, their apices flexed ventrad. Abdominal tergites with long acicular bristles forming on tergites 73 I–IV along sides of longitudinal groove a compact transverse band rounded at anterior margin. Urogomphus highly elongate, laterally with small setigerous, tubercular spinules.

One palearctic species belongs to the genus *Lamia* F.

Type species: *Cerambyx textor* Linnaeus, 1758.

1. **Lamia textor** (L.)

Linnaeus, 1758. *Syst. Nat. Ed.*, 10: 392 (*Cerambyx*); Cherepanov, 1952.

Vrednye nasekomye polezashchitnykh lesnykh polos, 90–91; Plavil'shchikov, 1958. *Fauna SSSR*, 23, pt. 1: 498–500; Zolotarenko, 1960. *Tr. biol. in-ta SO AN SSSR*, 6: 167–171; Cherepanov and Cherepanova, 1975. *Zhuki-drovoseki ivovykh lesov Sibiri*, 127–130.

Adult (Fig. 33): Body thick. Head with narrow median longitudinal groove, occiput rounded, sinciput compressed, in frontal region slightly convex, with compact striate punctation. Eyes broadly emarginate, finely faceted; upper ocular lobe twice narrower than lower lobe, their interspace narrow, ribbonlike. Antennae tapering toward apex, extending (male) or

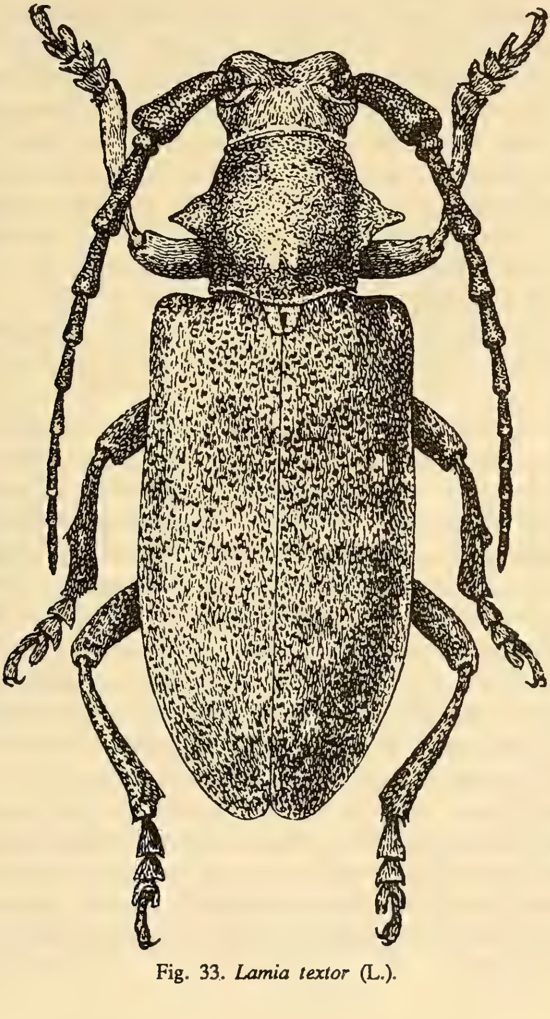


Fig. 33. *Lamia textor* (L.).

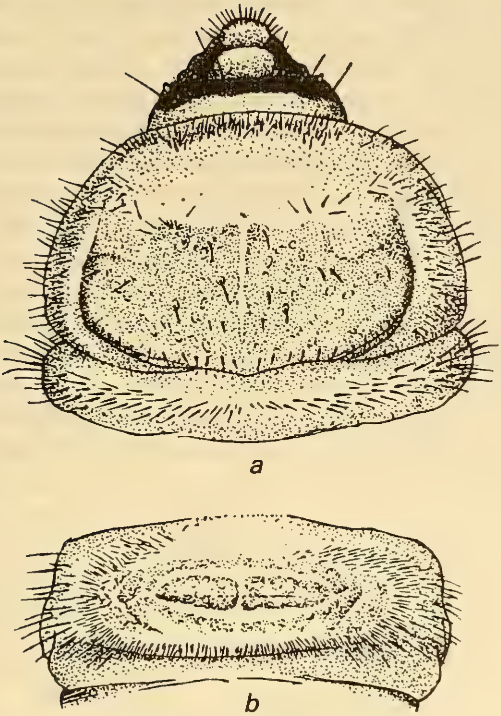
just short of extending (female) up to posterior third of elytra. First antennal segment thick, with bold compact rugose punctation, on outer side with sharp transverse apical ridge; 2nd–11th segments finely punctate, with short dense compact adherent golden (easily erasing) hairs.

Pronotum slightly transverse, disk convex, with coarse rugose punctation and golden-yellow adherent hairs; with flange near base and at apex; before anterior flange sometimes with floatlike convexity, medially with longitudinal groove or without it, laterally with large, conically extended tubercle terminating in acute apical spinule. Pronotal shield uniformly rounded posteriorly, with dense compact adherent hairs, medially with longitudinal glabrous groove extending from base to posterior margin.

Elytra massive, with projecting humeri, beyond shield slightly compressed, hind clivus steep, in anterior half with smooth black granules
74 (granules near base much larger, but gradually reduce posteriorly), in posterior half with minute punctures and continuous minute compact adherent yellowish-golden hairs, with smooth surface (f. typica), only sometimes with three longitudinal ridges (var. *tricarinata* Cornel), apically with narrowly rounded inner angles. Midtibiae on outer side with sharp spiniform projection, distal to this projection with dense coarse rusty bristles forming brush. Body ventrally with dense adherent golden-yellow pubescence. Body, antennae, and legs black. Body length 12–31 mm.

Egg: White, elongate, slightly curved, uniformly rounded at poles. Chorion with deep fine cellular sculpture. Length 4.5–5.0 mm, width 1.2–1.4 mm.

Larva (Fig. 34): Body comparatively thick. Head parallel-sided, half retracted into prothorax. Epistoma slightly convex, at anterior margin smooth, with dark rusty-brown fringe having long bristles forming transverse row, in anterior half additionally with dispersed short bristles, medially divided by sharp longitudinal suture, laterally fusing with temporo-parietal lobes; frontal sutures not perceptible. Hypostoma convex, parallel-sided or slightly tapering posteriorly, at anterior angles rounded, reddish-rust, in posterior half, especially laterally, whitish. Temporo-parietal lobes reddish-rust, at anterior margin with black fringe, behind it with two–three long bristles forming common transverse row together with bristles of epistoma. Clypeus large, convex, trapezoid, whitish, basally sometimes brownish-rust, here with pair of long lateral bristles. Labrum tapering toward base, in anterior
75 half with long dense bright rust bristles, basally glabrous, here rusty, in anterior half whitish. Mandibles elongate, apically insignificantly broadly truncate, with obtuse upper denticle, on inner side with carinate projection extending from lower apical denticle to middle of upper margin, on outer side near base with pair of parallel longitudinal dents, each bearing one long bristle distally.



74 Fig. 34. Larva of *Lamia textor* (L.).

a—head and pronotum; b—abdominal tergite with dorsal locomotory ampulla.

Pronotum slightly tapering anteriorly, twice wider than long, insignificantly sloping anteriorly, at anterior margin with whitish fringe having dense hairs forming transverse band. Pronotal shield perceptibly convex, sclerotized, with deep pitlike punctures, in anterior half with median longitudinal groove, at anterior angles with deep rectangular bulge, laterally demarcated by longitudinal grooves uniting anteriorly with triangular notch directed inward. Before shield lie setiform hairs forming transverse row uniting laterally with pilose field covering alar lobes. Prothoracic presternum with short dense hairs, laterally with small glabrous square. Eusternum convex, with long dense hairs, basally glabrous, coriaceous. Base of prosternum (basisternum s. sternellum) glabrous, laterally with dense hairs, in anterior half sclerotized. Meso- and metasterna with median transverse groove, in front and behind it with minute compact spinules forming rusty transverse band, ahead of it with hairs bent mediad and forming transverse row.

Abdomen thick, moderately elongate. Dorsal locomotory ampullae convex, medially divided by common longitudinal groove, two transverse grooves uniting laterally and one spatulate lateral groove extending from behind to dorsal side, with short deep striae. Abdominal tergites lateral to locomotory ampullae with dense rusty hairs. Ventral locomotory ampullae sclerotized, divided in posterior half by deep transverse groove uniting laterally with short longitudinal groove that bifurcates anteriorly, with deep striae forming faint granules. Abdominal tergites VIII–IX on disk glabrous, lustrous, at posterior margin and laterally in posterior half with sparse hairs. Body length 30–35 mm, width of head 3.5–4.0 mm.

Pupa (Fig. 35): Body thick, massive. Head broad, with projecting antennal tubercles, medially between them with deep longitudinal trough, occiput broadly rounded, beyond antennal base with one–three, along sides of frons with numerous acicular bristles, forming here a broad longitudinally elongate field. Labrum laterally and apically with dense acicular bristles forming a semicircle. Mandibles laterally with pair of adjacent

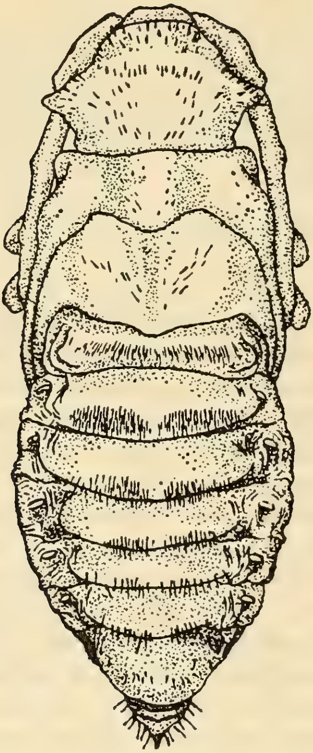


Fig. 35. Pupa of *Lamia textor* (L.).

bristles. Antennae compactly flexed laterad, extending beyond midfemora, their apices inclining ventrad.

Pronotum basally perceptibly broader than at apex, laterally with conically extended tubercle, at posterior and anterior margins with indistinct transverse groove, apically with bristles forming two clusters separated by small space, on lateral tubercles with bristles forming on each side one separate cluster, on hind clivus with bristles forming two narrow bands diverging from base laterad; between these bands pronotum with dispersed bristles forming extensive field on disk. Mesonotum convex, posteriorly with significantly produced but terminally with more convex shield, laterally with dense or dispersed bristles forming two longitudinal bands. Metanotum slightly convex, with median longitudinal groove, with coarse
76 bristles forming two bands diverging from middle of base toward anterior angles.

Abdomen tapering from base toward tip (male) or in region of segments III–IV perceptibly enlarged (female). Abdominal tergites in posterior half convex, medially with narrow common longitudinal groove, along its sides with dense adherent rusty bristles forming transverse band broadly rounded at anterior margin. This transverse band on tergites V–VI narrow, less distinct. Tergite VII posteriorly broadly rounded, in anterior half glabrous, lustrous, beyond middle with bristles forming an interlacing transverse row or narrow transverse band. Tergite VIII convex, semicircular, with dispersed bristles forming transverse interlacing row. Urogomphus conically extended, apically with sclerotized acute spinule, laterally with thin bristles on sclerotized base. Tip of abdomen (ventral view) obtuse, laterally bound by ridges covered with bristles on produced sclerotized base. Valvifers of females small, hemispherical, contiguous, apically with tubercle. Body length 25 mm, width of abdomen 10 mm.

Material: Collected from western and eastern Siberia, in Ussuri-Primor'e region. Adults 174, larvae 11, pupae 2 (male and female), larval exuviae with beetles and pupae from cells 2.

Distribution: Palearctic from the Atlantic to the Pacific Ocean coasts: Europe, Siberia including Sakhalin, northern Mongolia, northern China, Korea, Japan.

Biology: Inhabits deciduous plantations. Ecologically mainly associated with willow species (*Solicacea*). Flight of beetles begins in May and is concluded in August. Beetles maximum in June and July. For example, during systematic collection in different regions, we collected 145 beetles—7.0% in May, 23.4% in June, 50.3% in July, 13.8% in August, and 5.5% in September. At the end of the season, we found beetles of the new generation, which had overwintered. After hibernation, beetles feed on the bark of young shoots of willow, poplar, and aspen and then mate. Females oviposit under the bark through cavities made by the man-

77 **Table 8. Development of *Lamia textor* (L.)**

Year	May	June	July	August	September	October
1st	A	AE	AEL	AEL	EL	L
2nd-3rd	L	L	L	L	L	L
4th	L	L	LP	LPA	PA	A

dibles. Generally one, rarely two–three eggs are laid in each cavity. Females infest exposed roots and basal part of the stems of growing trees or stubs with shoots. Often the eggs are aligned on thin stems of the offshoots. With time, the beetles take to supplementary feeding. During the course of her life a female lays up to 30 or more eggs. Egg development continues for about three–four weeks. The larvae hatching under the bark initially nibble a small area, then bore into the wood, and there make longitudinal galleries, filling them with fine frass. Larvae of the last instar, after the second hibernation, make a cell longitudinal to the stem, close it at both ends with a plug consisting of fibrous frass, and pupate in it. Length of cell 30 mm, width 15 mm, thickness of wood layer between cell and bark 2 mm. Diameter of stems and basal part (underground zone) of stems infested by the insects up to 4.5 cm or more. Pupae are found from July-end to September.

Young beetles appear in August and September. They remain in the pupal cell for about one week. Then in the underground zone (basal part) of the stem and on the roots, they nibble a round hole (up to 12 mm in diameter) and exit the cell through it. Initially, they feed on the bark of young shoots of willow, poplar, and aspen. Then with the onset of frosts, they move into forest litter and hibernate there. They emerge from hibernation in spring with the commencement of warmth. Emergence of beetles concludes in May. Generation—three-year cycle (Table 8). Based on two individuals, weight of larvae before pupation 766–790 mg, pupae 620–648 mg, beetles 480–517 mg.

77 *Lamia textor* (L.) is found sporadically, damages willow, poplar, and aspen. Once a larva was found in the root of a sea buckthorn. There are reports of the development of this species on alder.

2. Genus *Lamiomimus* Kolbe

Kolbe, 1886. *Arch. Naturg.*, 52: 224; Gressit, 1951. *Longic. Beetles of China*, 2: 354; Plavil'shchikov, 1958. *Fauna SSSR*, 23, pt. 1: 502.

Adult: Characterized by large thick body. Head massive, broad, unevenly punctate. Antennae longer (male) or slightly shorter (female) than body, with long 3rd segment. Pronotum laterally with large conical, acutely produced tubercle. Elytra convex, beyond humeri insignificantly compressed laterally, in anterior half with lustrous black granules.

Larva: Body elongate. Pronotum at anterior margin with densely pilose transverse band. Pronotal shield rusty, compactly sclerotized, demarcated in front of anterior angles by broad triangular notches, laterally with short longitudinal grooves. Locomotory ampullae convex, entirely sclerotized, without granules, on dorsal side divided by two, on ventral side by one transverse groove curved backward. Anal pore transverse.

Pupa: Characterized by large body, presence of sparse wide-set bristles on pronotum. Tergites of abdominal segments I–III with dense acicular bristles; tergites IV–VI with sparse bristles forming interlacing transverse row. Urogomphus at tip of abdomen with acute rusty-brown spinule.

Two species belong to the genus *Lamiomimus* Kolbe, of which *L. gottschei* Kolbe is distributed in the southeast Ussuri-Primor'e region, Korea, and northeast China, and *L. chinensis* Breun. in northwest China.

Type species: *Lamiomimus gottschei* Kolbe, 1886.

1. **Lamiomimus gottschei** Kolbe

Kolbe, 1886. *Arch. Naturg.*, 52: 224; Plavil'shchikov, 1958. *Fauna SSSR*, 23, pt. 1: 503–504.

Adult (Fig. 36): Body stocky, thick. Head with large broad, almost flat punctures (spaces between punctures rough), with short adherent yellow, often unevenly dispersed hairs forming random dense clusters, medially with narrow longitudinal groove. Mandibles on outer side near apex smooth, lustrous, before middle with longitudinal streaks, in posterior half with compact deep (male) or elongate (female) punctation, with gray hairs. Eyes rather large, sharply faceted, broadly emarginate, space between ocular lobes not narrower than lobes. Antennae highly tapering toward apex, extending beyond apex of elytra by 10th segment (male) or just short of it (female). First antennal segment thick, laterally at apex roundly or carinately produced, with coarse compact punctation. Third segment longer than 1st, 78 barely shorter than 4th and 5th together, in upper portion with barely perceptible, longitudinal trough, with double (deep bold and very fine) punctation (double punctation up to 8th segment).

Pronotum basally with sharp flange having two transverse grooves, apically with gentle flange having one more very distinct, especially laterally, transverse groove, disk convex, with uneven surface and coarse punctation, with sinuous striae, medially before base with tubercular elevation, laterally with spiniform, acutely produced tubercle, with somewhat rusty adherent, at places specklike dense hairs forming broad longitudinally elongate spot in front of shield, indistinct spot near base of lateral

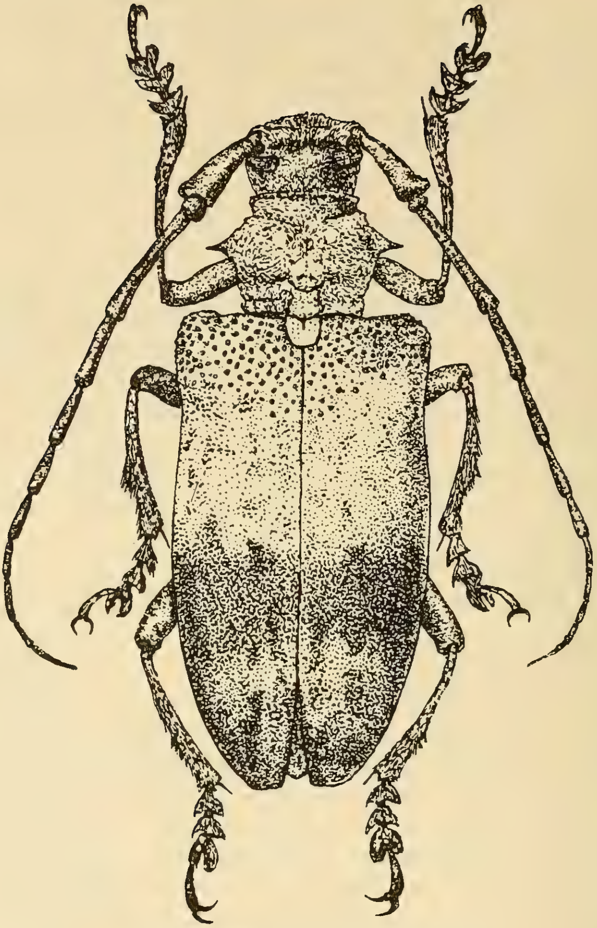


Fig. 36. *Lamiomimus gottschei* Kolbe.

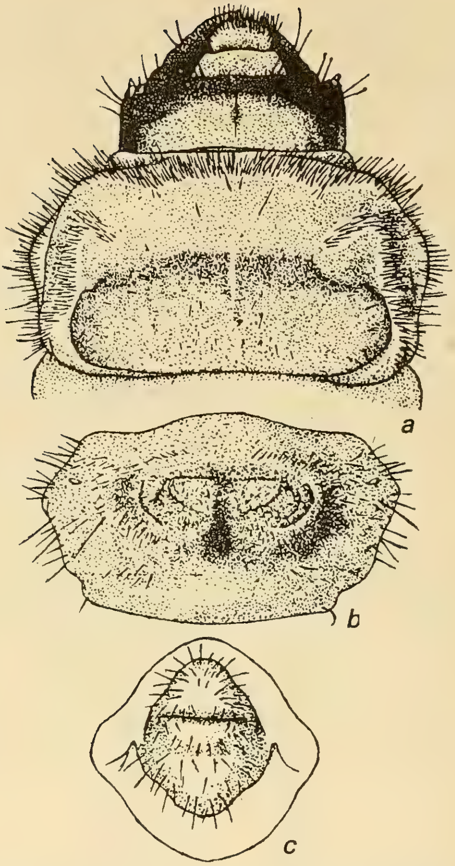
tubercles, two small spots at posterior margin of anterior flange. Pronotal shield rounded posteriorly, with dense rusty adherent pubescence, basally with glabrous median longitudinal band.

Elytra with projecting humeral tubercles, beyond humeri in anterior half perceptibly compressed, disk convex, in posterior fourth steeply sloping, apically slightly obtuse, with narrowly rounded angles, in anterior third with smooth round black tubercles, sometimes extending to posterior margin of somewhat rusty anterior band, with minute dense punctation and short dense brownish and rusty hairs forming two transverse bands—one before middle broad, second in posterior half narrow. Legs comparatively short, femora thick, midtibiae on outer side with more, hind tibiae with less distinct angular projection; distal to this projection with dense brownish or yellowish-brown bristles forming brush. Body ventrally with somewhat rusty, uneven pubescence. Body, antennae, legs, and elytra black or blackish-brown. Body length 23–35 mm.

Egg: Elongate, at poles almost uniformly rounded, white with brownish tinge. Chorion not transparent, matte, with fine shagreen sculpture. Length 5.0–5.8 mm, width 1.2 mm.

Larva (Fig. 37): Characterized by elongate body, compact sclerotized pronotal shield and locomotory ampullae, and dense coarse (setaceous) pubescence laterally on thorax and abdominal tergites. Head parallel-sided, highly retracted into prothorax. Epistoma at anterior margin with broad black fringe, behind it somewhat rusty, here with deep wide-set setigerous 79 pores, in posterior half yellowish, apically broadly rounded, laterally with barely perceptible frontal sutures, medially divided by sharp dark cinnamon longitudinal suture. Hypostoma laterally with straight sutures, at anterior margin dark rust, with transverse striae, medially with dark rust longitudinal gular band, in posterior half bright rust. Temporo-parietal lobes at anterior margin with dark brown fringe covering antennal socket, behind it rusty, with solitary setigerous pores, toward base much brighter. Antennal apices barely projecting beyond anterior margin of head capsule. Clypeus large, basally occupying almost entire anterior margin of epistoma, transverse, basally glabrous, with rusty-brown fringe, at anterior margin broadly rounded, disk convex, with large thick bristles. Mandibles black, elongate, apically slanting, on outer side with median transverse (sometimes faint) striae, basally with two parallel notches, each bearing one thick bristle terminally.

Pronotum twice wider than long, at anterior margin with white fringe having transverse dense pilose band (which is thrice angularly produced posteriorly), behind band with broad glabrous rusty square passing over laterally beyond alar lobes. Pronotal shield rusty, compactly sclerotized, with deep longitudinally extended punctures, in anterior half with narrow 80 median longitudinal groove, at anterior margin with long solitary bristles, laterally with deep longitudinal grooves, in front of anterior angles with broad triangular notch. Alar lobes with coarse setigerous rusty hairs forming longitudinal band curved in front of triangular notches inward and backward at an acute angle. Mesonotum laterally with dense hairs, disk with narrow transverse pilose band. Metanotum on disk with median transverse groove, in front of, and especially behind this groove with somewhat short rusty hairs. Prothoracic presternum with dense rusty hairs, laterally with rusty glabrous lustrous square. Eusternum convex, coriaceous, in posterior half glabrous, with short transverse striae, in anterior half with numer-



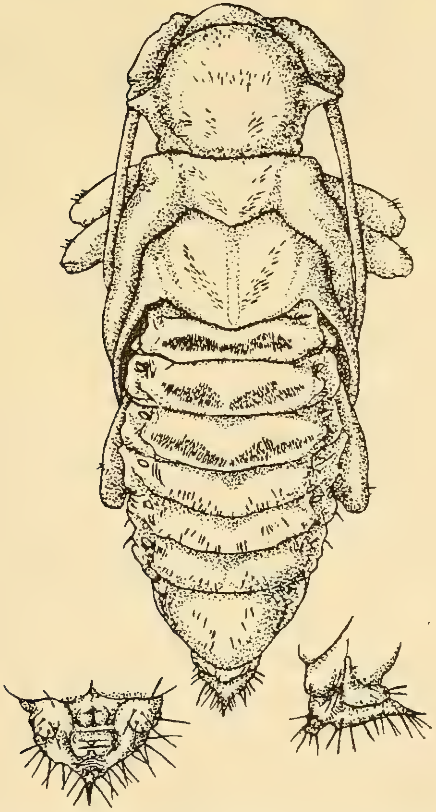
79 Fig. 37. Larva of *Lamiomimus gottschei* Kolbe.

a—head and pronotum; b—abdominal tergite with dorsal locomotory ampulla; c—tip of abdomen (posterior view).

ous thick rusty hairs. Base of prosternum (basisternum s. sternellum) in anterior half sclerotized, laterally with dense rusty hairs. Meso- and metasterna with median transverse sclerotized band divided by groove into anterior and posterior parts, in anterior half with numerous setiform hairs forming narrow transverse band.

Abdomen elongate, segments I–VII with well-developed locomotory ampullae. Abdominal tergites laterally with dense setiform hairs. Dorsal locomotory ampullae convex, sclerotized, with minute dense spinules, medially divided by common longitudinal groove, anteriorly with straight, posteriorly with transverse groove curved backward, laterally with indistinct outcurved folds. Tergites VIII–IX with sparse dispersed setiform hairs. Ventral locomotory ampullae compactly sclerotized, in posterior half with transverse groove curved backward, uniting laterally with short longitudinal groove. Abdominal sternites VIII–IX on disk glabrous, laterally with sparse setiform hairs. Body length up to 50 mm, width of head up to 6.0 mm.

Pupa (Fig. 38): Characterized by large body and thick acicular bristles on dorsum. Head between antennae with broad longitudinal trough, in females more enlarged, occiput smoothly rounded, sinciput flat, here beyond base of antennae with one–two bristles, in frontal region laterally (sometimes in anterior half) with numerous acicular bristles bent forward. Labrum apically with thin dense bristles forming semicircular rim interrupted med-



79 Fig. 38. Pupa of *Lamiomimus gottschei* Kolbe (female).

ially. Antennae flexed laterad, bent ventrad in second half, semicircular (female) or almost annular (male).

Pronotum on disk convex, sloping toward base and toward apex, lustrous, with thin dispersed bristles, laterally with acutely produced conical tubercle bearing posteriorly three–four bristles. Mesonotum laterally somewhat broadly compressed, at posterior margin with angularly extended bristle, lateral to it in front with numerous bristles forming two perceptibly diverging longitudinal clusters. Metanotum insignificantly convex, with narrow median longitudinal groove, in posterior half with acicular paramedial bristles forming two clusters diverging from base.

Abdomen gradually tapering toward tip. Abdominal tergites in posterior half scalariform, convex, with distinct median longitudinal groove, on segments I–III in posterior third with dense acicular, backwardly directed rusty bristles forming compact transverse band narrowly interrupted in region of longitudinal groove. Tergites IV–VI at posterior margin with sparse dispersed bristles forming an interlacing transverse row. Tergite VII triangular, posteriorly narrowly rounded, disk moderately convex, 81 lustrous, beyond middle with a few randomly dispersed bristles. Tergite VIII very short, foldlike, with sparse bristles forming interlacing transverse row. Urogomphus at tip of abdomen small, conically extended, terminating in well-sclerotized rusty-brown spinule. Tip of abdomen (ventral view) laterally bound by sharp ridges bearing somewhat rusty bristles, sometimes on lower margin with additional small acute or obtuse spinules. Valvifers of female small, elongate, basally with perceptible interspace, bent toward each other. Body length 28–37 mm, width of abdomen up to 12 mm.

Material: Collected in Ussuri-Primor'e region. Adults three, larvae three, pupae six males and females, larval exuviae with pupae and beetles from cells five.

Distribution: Ussuri-Primor'e region, northeast China, Korea. We found it in the coastal zone of Lake Khanka near the village Il'inka and in the region of Ovchinnikov.

Biology: Inhabits broad-leaved forests. Beetles appear in July and are found up to the end of summer. Females lay eggs on the roots, radical part of stubs, and stems of drying trees. In the ovaries of a female caught near an oak stub on July 10th, we found 20 fully mature eggs. Beetles infest oak and birch. Larvae live under the bark and make longitudinal sinuous galleries impressed on the wood. They fill the galleries with coarse fibrous frass. Larvae infest thin as well as thick roots and the basal (underground) part of stems. After the third hibernation, they make a cell under the bark, completely line it with fibrous frass, and pupate. Pupation takes place in July; pupae are found up to mid-August. In 1972 near Lake Khanka, larvae, pupae, and beetles were found in the second ten days of July.

Pupal stage under temperature fluctuation from 12.2°C in the morning to 35.4°C later in the day (average 21.8 ± 0.9°C) lasted about three weeks. Beetles leave the pupal cell the same summer; they require supplementary feeding. In the laboratory, they fed on the bark of birch and oak. Length of pupal cell up to 30 mm, width 18 mm. Width of gallery made by last instar larvae up to 20 mm. Weight of larvae before pupation 1,074–2,760 mg, pupae 967–2,510 mg, young developed beetles 806–2,010 mg.

Lamiomimus gottschei Kolbe is found sporadically. It inhabits forest fringes, felling areas and glades with isolated standing trees. We found it in the roots of birch and oak stubs.

27. Tribe MONOCHAMINI

Adult: Characterized by long antennae, in most cases considerably (*Monochamus* Guèr. *Acalolepta* Pasc.) or barely longer than body, on inner side without setae. First antennal segment apically with closed (*Monochamus* Guèr. and others) or open cicatrix. Pronotum laterally with acutely produced spiniform tubercle. Elytra smooth, with simple, basally often with granular punctation, in females generally parallel-sided, in males more or less tapering from base toward apex, apically rounded. Hind wings well developed. Legs long. Forelegs of males (*Monochamus* Guèr.) generally longer than hind legs, with enlarged tarsi. Outer margin of midtibiae with distal notch bearing bristles forming dense brush.

Larvae: Body sufficiently large, elongate. Head half or more retracted into prothorax. Pronotum at anterior margin with white matte fringe, behind 82 which somewhat rusty hairs form broad or narrow transverse band. Pronotal shield sclerotized, yellowish, anterior angles emarginate. Thoracic legs absent. Locomotory ampullae well developed on abdominal segments I–VII, with distinct ampullaceous granules forming on dorsal side three–four transverse rows (resembling a transversely extended ellipse) and on ventral side two rows divided by transverse groove. Anal pore triradiate.

Pupae: Body large or medium-sized. Antennae basally flexed laterad, further bent ventrad, here annular or spiraled. Pronotum laterally with large conically extended tubercle. Abdomen elongate, tapering toward tip. Abdominal tergites I–VI in posterior half more elongate, with common median longitudinal groove, with short, often setigerous (*Monochamus* Guèr.) or long acicular spinules (*Acalolepta* Pasc.) forming broad or narrow transverse band interrupted medially by longitudinal groove. Tip of abdomen with large urogomphus terminating in acute sclerotized spinule. Only in *Acalolepta degenera* (Bat.) is this spinule feeble.

In the fauna of northern Asia, there are two genera from the tribe Monochamini. The genus *Lamiomimus* Kolbe, earlier included in this tribe, is much closer to the tribe Lamiini in morphological characters of the larvae and pupae. All representatives of the tribe Monochamini belong to the group of dendrophils, some of them (*Acalolepta* Pasc. and *Monochamus guttatus* Bless.) are ecologically associated with deciduous trees, others (*Monochamus* Guèr.) with coniferous woody plant species. Many species cause significant damage to forestry, destroy wood, and reduce its technical qualities.

KEY TO GENERA

Adults

1 (2). First antennal segment with closed cicatrix. . . . . 1. **Monochamus** Guèr.
2 (1). First antennal segment with open cicatrix. . . . . 2. **Acalolepta** Pasc.

Larvae

1 (2). Abdomen laterally with dense hairs. Lower ray of triradiate anal pore considerably shorter than lateral rays. . . . . 1. **Monochamus** Guèr.
2 (1). Abdomen laterally with comparatively sparse, only in some representatives (*A. luxuriosa* (Bat.)) with somewhat dense hairs. Lower ray of anal pore not shorter than lateral rays. . . . . 2. **Acalolepta** Pasc.

Pupae

1 (2). Abdominal tergites with short spinules. . . . . 1. **Monochamus** Guèr.
2 (1). Abdominal tergites with long acicular or setiform spinules, only in individual representatives (*A. luxuriosa* (Bat.)) with small* setigerous spinules. . . . . 2. **Acalolepta** Pasc.

1. Genus *Monochamus* Guèr. 83

Guèrin-Meneville, 1826. *Dict. Class. d'Hist. Nat.*, 9: 186; Plavil'shchikov, 1958. *Fauna SSSR*, 23, pt. 1: 506–510; Cherepanov and Cherepanova, 1973. *Nov. i maloizv. vidy fauny Sibiri*, 7: 56–58; Mamaev and Danilevskii, 1975. *Lichinki zhukov-drovosekov*, 231–233.

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*Sic; should read 'large', cf. Key to Species (p. 164) and description on p. 168—General Editor.

Adult: Body moderately elongate, large (*M. grandis* Waterh., *M. urussovi* (Fisch.)) or comparatively small (*M. guttatus* Bless.). Antennae 1.5–2.5 times longer than body (*M. sutor* (L.) and others) or barely extending beyond apex of elytra (*M. impluviatus* Motsch.). First antennal segment thick, with bold punctation, apically on outer side with large closed cicatrix; remaining segments, beginning from 3rd, in females basally with gray or whitish pilose ringlet, with minute simple, in males without ringlet, with minute granular punctation. Eyes broadly emarginate, sharply faceted. Pronotum laterally with conically extended tubercle, apically and basally with flange, with bold or minute, generally compact punctation; flanges often transversely striate. Elytra parallel-sided or slightly tapering toward apex, in anterior half or only at base with bold coarse (striate or granular) punctation. Forelegs of males (*M. grandis* Waterh., *M. urussovi* (Fisch.)) very long, foretarsi enlarged, with long lateral hairs.

Egg: Elongate, white, rounded at poles. Chorion with fine cellular sculpture.

Larva: Body white. Head flat, half retracted into prothorax. Epistoma laterally fusing with temporo-parietal lobes, frontal sutures not perceptible or faint. Hypostoma divided medially by a much darker, anteriorly enlarged gular band. Antennae short, conical. Ocelli convex, below antennal bases. Pronotum at anterior margin with broad white matte fringe, behind it with transverse pilose band. Pronotal shield yellowish-rust, sclerotized, with minute dense spinules, at anterior angles emarginate, laterally demarcated by longitudinal grooves uniting anteriorly with transverse triangular notches. Thoracic legs absent. Locomotory ampullae developed on abdominal segments I–VII, consist of ampullaceous granules forming on dorsal side four transverse rows and one lateral longitudinal outcurved row. Anal pore triradiate, lower ray short, two–three times shorter than lateral rows (*M. urussovi* (Fisch.) and others) or long, slightly shorter than lateral rays (*M. saltuarius* Gebl., *M. guttatus* Bless.). In first instar larvae, mandibles with one acute spinule on outer side, anterior margin of epistoma with two, and that of hypostoma with four spinules; abdominal segments I–VIII with one spinule laterally. These spinules disappear after molt.

Pupa: Characterized by thin acute spinules on dorsum and highly produced urogomphus bearing an acute sclerotized spinule apically. Antennae long, in second half spiraled, forming 1.5–3.0 loops, only in *M. impluviatus* Motsch. up to 1.0–1.5 loops.

The genus *Monochamus* Guèr. is the richest in species composition in the fauna of Ethiopian and Indo-Malaysian regions. From the Palearctic about twenty and from the Soviet Union nine species are known, of which eight are distributed in northern Asia. These include *M. impluviatus* Motsch., belonging to the group of Trans-Siberian species, *M. guttatus* Bless., belonging to the relics of broad-leaved forests of the Far East, *M. grandis* Waterh.

and *M. nitens* (Bat.) belonging to the insular fauna of the Pacific Ocean.

84 Species of the genus *Monochamus* Guèr. are of paramount importance in the dynamics of biocenoses and in forestry. The flight of beetles generally commences about midsummer and concludes by August-end or early September. Beetles of all the species require supplementary feeding; generally they (*M. sutor* (L.), *M. urussovi* (Fisch.), and others) feed on the bark of thin shoots of conifers, but some (*M. guttatus* Bless., *M. urussovi* (Fisch.)) feed on deciduous woody plants. The beetles mate after maturation of their gonads and the females begin to oviposit. For this purpose, the female initially nibbles a cavity in the bark up to the bast using its mandibles, introduces its ovipositor, and lays an egg. After two–three weeks, larvae hatch from the eggs and live for about two years. They initially live under the bark, then bore into the wood, throwing frass out through ventilation holes. After the second hibernation, the larvae pupate. Emergence of young beetles from the wood is usually concluded by June-end or in July. Foci of mass multiplication of species of the genus *Monochamus* Guer. appear in forests that have been logged or damaged by fires or severely infested by "primary" pests (*Dendrolimus sibiricus* Tschet.). Larvae make galleries in the wood and thus cause significant economic damage. Wood damaged by them becomes unfit for industrial requirements. The maximum damage is caused by *M. urussovi* (Fisch.), *M. sutor* (L.), and *M. galloprovincialis* (Oliv.).

Type species: *Cerambyx sutor* Linnaeus, 1758.

KEY TO SPECIES

Adults

1 (14). Elytra laterally beyond middle without sharply distinct white spotlet, at most with indistinct band or spotlets not distinguishable from other spots. Eleventh antennal segment without appendage.

2 (7). Coarse striate or granular punctation covers entire anterior half of elytra.

3 (6). Elytra uniformly convex, in anterior third without transverse notch, hind clivus without whitish tinge.

4 (5). Body and elytra black, without bronze tone. Pronotal shield with median longitudinal glabrous band throughout length. Eurasia. . . . . **1. M. sutor** (L.)

5 (4). Body and elytra black with bronze tone. Pronotal shield entirely with dense yellow or somewhat rusty hairs, only basally with short black glabrous band. Eurasia, northern Africa. .... **2. M. galloprovincialis** (Oliv.)

6 (3). Elytra not entire, in anterior third with transverse notch, hind clivus with whitish tinge due to dense pubescence. Eurasia. . . . . 3. **M. urussovi** (Fisch.)

7 (2). Coarse striate or granular punctation covers only anterior fourth (at most anterior third) of elytra. Remaining part of elytra with smooth fine sparse punctation.

8 (9). Body very large, length more than 32 mm. Elytra black, without sharp white spots or specks, sometimes only with barely perceptible, faint grayish pubescence. Kunashir, Japan. . . . . 4. **M. grandis** Waterh.

9 (8). Body smaller, length not more than 30 mm. Elytra black, with sharply projecting white or grayish-yellow pilose spots.

85 10 (11). Elytra not matte, lustrous, between white spots with sparse semierect brownish hairs not forming continuous pubescence. Kunashir, Japan. . . . . 7. **M. nitens** (Bat.)

11 (10). Elytra matte or with barely perceptible sheen, between white spots with dense adherent brownish pubescence.

12 (13). Antennae markedly longer than body (male, female). Elytra with large white spots. Eurasia. . . . . 5. **M. saltuarius** Gebl.

13 (12). Antennae barely longer (male) or almost not longer (female) than body. Elytra with minute white or yellowish-gray specks. Northern Asia from the Urals to the Pacific Ocean coasts. . . . . 6. **M. impluviatus** Motsch.

14 (1). Elytra laterally beyond middle with very distinct white pilose spotlet. Eleventh antennal segment with distinct appendage. Far East from Khabarov to the Pacific Ocean. . . . . **M. guttatus** Bless. (*M. guttulatus* Gress.)

Larvae

1 (8). Spiracles laterally on abdominal segment I not larger or barely larger than spiracles on segment II.

2 (3). Spiracles of abdominal segments large, almost not smaller than spiracles of mesothorax. Mainly on spruce, cedar, larch, rarely fir. . . . . 1. **M. sutor** (L.)

3 (2). Spiracles of abdominal segments not large, 1.5–2.0 times smaller than spiracles of mesothorax.

4 (5). Shield of pronotum without white punctures, at most with minute punctures or with striae, not devoid of sclerotization. Mainly on pine. . . . . 2. **M. galloprovincialis** (Oliv.)

5 (4). Shield of pronotum with white uneven punctures, devoid of sclerotization.

6 (7). Shield of pronotum basally with numerous short bristles forming transverse row. Mainly on fir. . . . . 3. **M. urussovi** (Fisch.)
7 (6). Shield of pronotum basally with solitary bristles forming transverse row. On conifers . . . . 4. **M. grandis** Waterh.
8 (1). Spiracles laterally on abdominal segment I, 1.3–2.0 times larger than spiracles of second and subsequent abdominal segments.
9 (10). Lower (ventral) ray of anal pore short, half length of lateral rays. On conifers, mainly spruce, cedar, and fir . . . . 5. **M. saltuarius** Gebl.
10 (9). Lower (ventral) ray of anal pore long, slightly shorter or not shorter than lateral rays.
11 (12). White punctures basally on pronotal shield forming compact transverse interlacing row. On larch. . . . . . 6. **M. impluviatus** Motsch.
12 (11). White punctures basally on pronotal shield not forming compact transverse row. On deciduous plants. . . . . 8. **M. guttatus** Bless.

Pupae

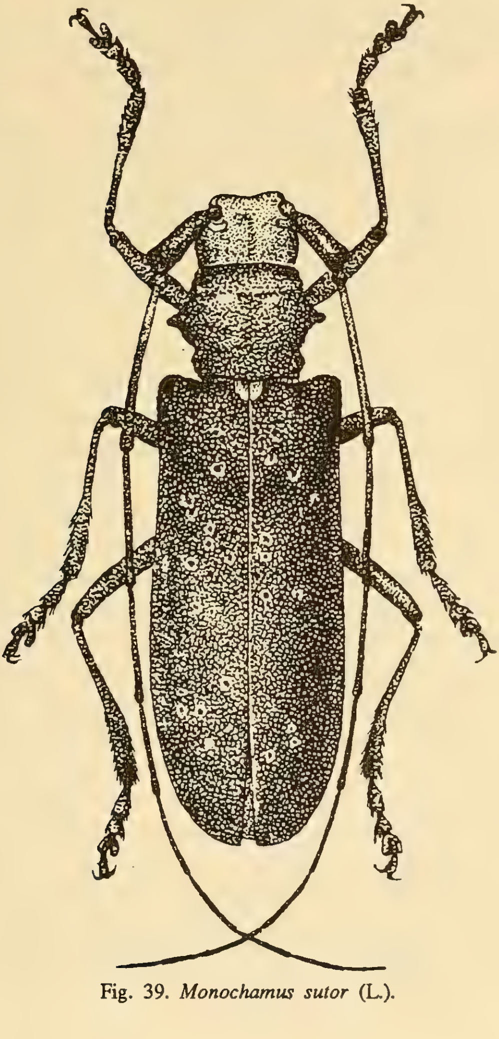
1 (8). Tip of abdomen on ridges bordering it laterally (ventral view) with large sclerotized spinules.
2 (5). Abdominal tergite VII in posterior third with numerous large styloid spinules.
86 3 (4). Spiracles laterally on abdominal segments II–VI highly elongate, rimiform, curved, four times longer than wide . . . . 1. **M. sutor** (L.)
4 (3). Spiracles laterally on abdominal segments II–VI slightly elongate, ellipsoid, not curved, twice longer than wide. . . . . 3. **M. urussovi** (Fisch.)
5 (2). Abdominal tergite VII in posterior half with numerous minute spinules.
6 (7). Labrum apically with solitary spinules not forming dense field here. . . . . 2. **M. galloprovincialis** (Oliv.)
7 (6). Labrum apically with dense spinules forming in second half a continuous edged field. . . . . 4. **M. grandis** Waterh.
8 (1). Tip of abdomen on ridges bordering it laterally with minute, sometimes setigerous spinules.
9 (12). Abdominal tergite VIII without bristles, glabrous, lustrous. Tip of abdomen laterally with short bristles or without them.
10 (11). Antennae long, in second half spiraled, with 1.5 (female) or 2.5 (male) loops. . . . . 5. **M. saltuarius** Gebl.
11 (10). Antennae short, in second half annular (female) or spiraled, with 1.5 loops (male) . . . . 6. **M. impluviatus** Motsch.

12 (9). Abdominal tergite VIII with long bristles forming transverse row. Tip of abdomen laterally with long bristles at base of spinules. . . . . 8. **M. guttatus** Bless.

1. **Monochamus sutor** (L.)

Linnaeus, 1758. *Syst. Nat.*, ed. 10: 392 (*Cerambyx*); Plavil'shchikov, 1958. *Fauna SSSR*, 23, pt. 1: 514–519; Cherepanov and Cherepanova, 1973. *Nov. i maloizv. vidy fauny Sibiri*, 7: 62–63.

Adult (Fig. 39): Body moderately elongate. Head not broader than



87 Fig. 39. *Monochamus sutor* (L.).

pronotum, with deep median longitudinal groove, deep uneven punctation and dense or sparse gray or brownish hairs. Antennae long, 2.5 times longer (male) or considerably shorter, less than 1.5 times longer than body, extending beyond apex of elytra by 8th segment (female), with minute granular (male) or simple compact (female) punctation. Eyes sharply faceted, broadly emarginate; upper ocular lobes closer to each other, distance between them less than interspace between antennal bases.

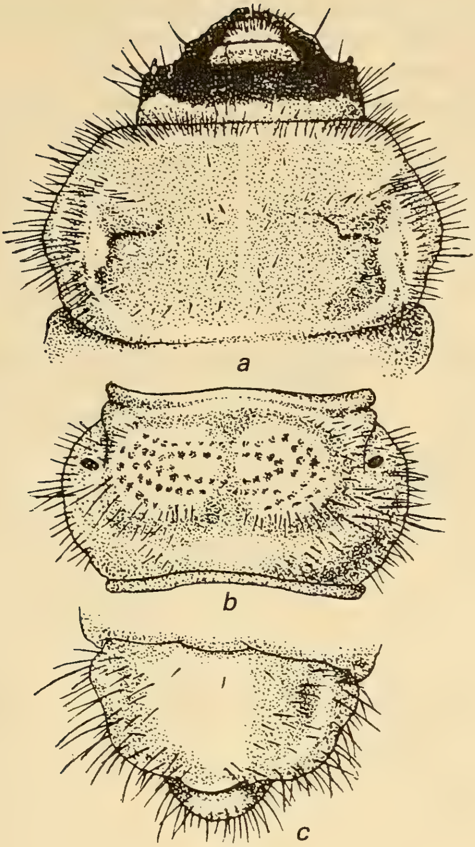
Pronotum basally and apically with gentle flange, here with thin transverse striae (folds), disk convex, with uneven striate punctation and gray, very sparse, sometimes unevenly dense, adherent, laterally with dark brown erect hairs. Lateral tubercles of pronotum conically extended. Pronotal shield flat, length not more than width, basally with dense adherent gray or yellowish hairs, medially with longitudinal glabrous band, rounded posteriorly.

Elytra parallel-sided, disk convex, beyond base entire, without perceptible transverse notch, in anterior half with coarse deep, in posterior half much finer, on hind clivus evanescent punctation, with dense brownish adherent hairs and minute white pilose (especially in female) specks (f. typica) or with rusty pilose specks (ab. *fuscomaculatus* Petri); often brownish hairs sparse, not forming continuous pubescence, and elytra appear glabrous (m. *pellio* Germ.). Body ventrally with short adherent gray and
87 long semierect brownish hairs. Midtibiae on outer side with dense apical brush of golden or brownish bristles. Body length 15–26 mm.

Egg: White, matte, becoming brownish with time, elongate, slightly curved, rounded at poles. Chorion with fine reticulate, barely perceptible (as though erased) sculpture. Length 3.8 mm, width 0.8 mm.

Larva (Fig. 40): Characterized by location of bristles at anterior margin of pronotum, forming median transverse row passing over laterad to an enlarging transverse band. Head parallel-sided, flat, half retracted into prothorax. Epistoma flat, in anterior half reddish-rust, here with deep setigerous pores in transverse row, medially divided by distinct longitudinal suture, laterally fusing with temporo-parietal lobes. Frontal sutures not perceptible. Hypostoma reddish-rust, parallel-sided, with steeply rounded or almost straight anterior angles, slightly convex, sometimes with thin transverse striae, medially divided by an enlarging, much darker gular band. Temporo-parietal lobes in anterior half reddish-rust, with long sparse hairs, in posterior half dorsally whitish, at anterior margin almost black. Clypeus large, trapezoid, basally brownish-rust. Labrum highly tapering toward base, here reddish-rust, frontally convex, with dense bright rust bristles. Mandibles black, large, 2.2 times longer than wide, basally (lateral view) and apically highly sloping; ventral denticle elongate.

Pronotum insignificantly sloping toward head, length two-fifths its



88 Fig. 40. Larva of *Monochamus sutor* (L.).

a—head and pronotum; b—abdominal tergite with dorsal locomotory ampulla; c—tip of abdomen (dorsal view).

width, at anterior margin with whitish fringe, here with somewhat rusty setiform hairs forming median transverse row passing over to transverse band enlarging laterally, with long thin lateral hairs surrounding glabrous lustrous, somewhat rusty square, before shield glabrous, rusty, medially with narrow white longitudinal band, on disk with pair of thick wide-set coarse bristles in transverse row. Pronotal shield convex, sclerotized, rusty, with minute compact spinules and dispersed short bristles, with narrow
88 median longitudinal groove, laterally demarcated by longitudinal grooves uniting anteriorly with transverse triangular notches around broad notch at anterior angles. Alar lobes near longitudinal grooves glabrous, in pos-

terior half rusty, sclerotized, in anterior half coriaceous, whitish, on outer side with hairs forming longitudinal band encircling triangular transverse notches in front. Mesonotum matte, in posterior half with short hairs in transverse row. Metanotum with median transverse groove dividing two rows of minute ampullaceous sclerotized granules. Prothoracic presternum with short setiform hairs, laterally with rusty glabrous lustrous square. Eusternum coriaceous, in posterior half glabrous, in anterior half with setiform hairs. Base of prosternum (basisternum) coriaceous, transversely striate, laterally with short hairs. Meso- and metasterna with median transverse groove dividing two rows of barely perceptible, sclerotized ampullaceous granules, in anterior half with short setiform hairs forming narrow transverse band.

Abdomen laterally with rusty, not very dense hairs. Dorsal locomotory ampullae divided by common median longitudinal groove, with ampullaceous sclerotized granules forming two transversely elongate ellipses and one spatulate row covering them from outer side. Tergite IX on disk
89 glabrous, posteriorly and laterally with rusty hairs. Ventral locomotory ampullae divided by median transverse groove, with sclerotized ampullaceous granules forming common, transversely elongate cluster having gentle medial interception. Segment X (apex) with dense rusty hairs on sclerotized base. Lower ray of anal pore one-third to one-fourth length of transverse ray. Body length 40–50 mm, width of head 4.1–4.7 mm.

Pupa (Fig. 41): Body moderately elongate. Head between antennae with deep longitudinal trough, lateral to frons with numerous acicular spinules forming longitudinal band, before clypeus on each side with two–three spinules in an oblique transverse row, at level of anterior ocular lobe with dispersed spinules or without them, beyond antennae laterally on sinciput with one–three spinules, occiput smooth, rounded. Labrum elongate, narrowly rounded apically, along margin with short acicular spinules. Antennae flexed laterad, beyond midlegs spiraled ventrally.

Pronotum transverse, laterally with acutely produced tubercle, near base with narrow transverse groove, with dispersed sparse (especially in male) or numerous (female) minute spinules, sometimes forming transverse band near anterior margin. Mesonotum convex, with distinct or faint median longitudinal groove, at posterior margin with angularly produced shield, with dense or sparse spinules forming two bands extending from apex of shield toward base of elytra. Metanotum posteriorly rounded, with distinct median longitudinal groove and acute spinules forming two bands diverging anteriorly.

Abdomen elongate, gradually tapering toward tip. Abdominal tergites in posterior third convex, here with numerous acute spinules forming transverse band tapering laterally, in anterior third with more or less distinct

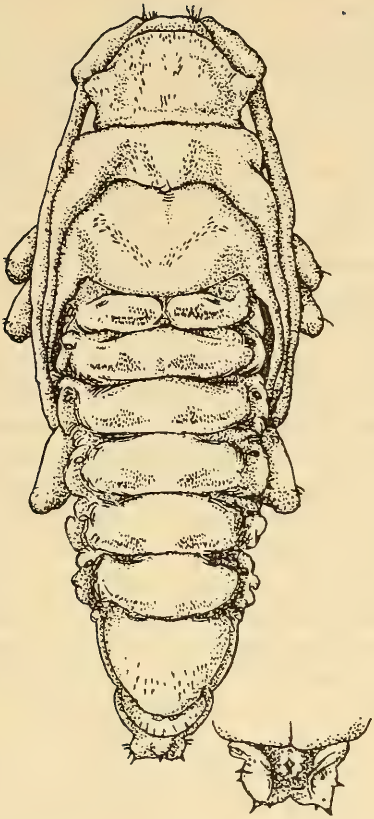


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Fig. 41. Pupa of *Monochamus sutor* (L.) (male).

lateral notch, medially with narrow common longitudinal groove. Tergite VII triangular, narrowly rounded apically, in posterior third (sometimes laterally as well) with minute dispersed spinules. Tergite VIII transverse, with sparse spinules. Urogomphus apically with large sclerotized spinule. Tip of abdomen (ventral view) on lateral ridges with large or minute spinules. Valvifers of female small, barely produced, bent toward each other. Body length 18–26 mm, width of abdomen 6–8 mm.

Material: Collected from different parts of western and eastern Siberia. Adults 2,732, larvae 12, pupae 8 males and females.

Distribution: Inhabits coniferous forests of Eurasia from Atlantic to Pacific Ocean coasts, almost from the Mediterranean Sea, northern Caucasus, northern Mongolia, northern China, North Korea, northern Japan in the south to the northern Polar Circle (up through range of coniferous forest).

Biology: Infests coniferous forests of different species composition. Found in large numbers in the southern as well as northern regions, on mountains ascends to limits of range of coniferous forests. Flight of beetles begins in the first days of June and continues to mid-September. Maximum beetles found in July; in northern regions adjacent to the Polar Circle (Oktyabr'sk, Kolyma) in July and first half of August (Table 9).

If mass flight is observed mainly in July south to the 58° parallel, then in the north it occurs to the 62° parallel and in high-altitude forests of southern regions of Siberia in August. Beetles emerging from sites of development have underdeveloped gonads. They require supplementary feeding. They fly to the canopy of trees and feed on the bark of young
90 shoots of cedar, spruce, and other conifers. The damaged shoots often break off and the trees look pruned. Similar damage is caused by the beetles of *Monochamus urussovi* (Fisch.). Sometimes they are found together with other species on the selfsame trees. After maturation of gonads, the beetles fly to the stems of drying, physiologically weakened or freshly felled (windfelled, sawn, and broken in storms) trees, mate there, and subsequently the females lay eggs. For oviposition, the female makes a cavity in the bark with its mandibles, introduces its ovipositor, and lays an egg under the bark in the bast region. One egg (rarely two) is laid in each cavity. Sometimes after making a cavity, the female does not oviposit in it. Females infest trees with a stem diameter of up to 20 cm or more; in some trees the ability to secrete oleoresin is lost but, at the same time, the bast does not dry. Trees attacked by stem pests are unsuitable for infestation if the bast is dry. Beetles live for up to two months. A female can lay more than 20 eggs during her life span. On dissecting a sexually mature female collected in nature, 25 fully developed eggs were found in the ovaries. Oviposition begins in the second half of June and continues almost to September. Maximum oviposition is observed at July-end and in the first half of August. Observations revealed that in temperate latitudes, the stems of uprooted and freshly prepared logs in felling areas lying in shade are infested almost uniformly by the insects, but in open areas warmed by the sun, mainly the basal and lateral regions, rarely the upper. This is because in clear weather the upper region is overheated by the sun during the day, with the temperature of the bark rising to 50°C or more. At this temperature the beetles become numb and remain motionless after a 15-minute exposure. With a longer exposure, they die since heat numbness is irreversible. In July at 12:00 noon in clear weather, the temperature at the lower depots near Artybash rose to 51.5°C in the upper part of the logs and to 23.2°C in the lower part. At this time the beetles remained in the lower part. Stems of standing rooted trees are fully infested peripherally, although to a lesser extent in the lower part than in other parts.

Table 9. Occurrence of *Monochamus sutor* (L.) beetles (based on summer collections)

Place	Northern latitude, degree	Total number of beetles collected	% Collection in			
			June	July	August	September
Oktyabr'sk on Ob' River	62–63	613	6.2	45.0	48.3	0.5
Zyryanka on the Kolyma	65–67	254	2.0	37.0	61.0	—
Tomsk	56–58	455	3.0	79.2	13.8	4.0
Novosibirsk	54–56	118	21.2	74.6	3.4	0.8
Kemerov	54–56	81	35.8	58.0	6.2	—
Altai	51–52	801	20.0	65.0	13.7	1.3
Tuva	51–52	54	18.5	72.3	9.2	—
Krasnoyarsk	55–57	133	8.3	62.4	29.3	—
Buryatia	52–53	104	1.9	43.3	54.8	—
Common indices		2,613	11.3	59.4	28.1	1.2

The incubation period of eggs varies from 2.5 to 4.0 weeks. In a field experiment in a gentle forest, under fluctuation of average diurnal temperatures from 15.7°C to 16.5°C, larvae hatched 16–26 days (average, 18.6 ± 0.4) after oviposition. We kept 40 eggs under observation from which the larvae hatched.

91 The developed larva breaks the chorion, feeds on the bast, then makes a broad sinuous, sometimes squarish gallery in it, initially not impressed but later impressed on the sapwood, and fills the gallery with brown fibrous frass. Larvae hibernate during winter under the bark in the first year of life. After the first hibernation, they bore into the wood, leaving an elongate entry hole (width up to 7.0 mm) longitudinal to the stem on the surface of the sapwood. In the wood, they make a transverse hollow gallery, penetrate to a depth of 10 cm or more, and intermittently return under the bark to throw out the brown fibrous frass through the ventilation hole made in the bark. During the second hibernation the larvae are in the wood or under the bark. After the second hibernation, with the commencement of warm weather, the larvae extend the gallery in the wood, come closer to the bark, and here make a pupal cell, separating it from the hollow gallery by a plug consisting of brown fibrous frass. The gallery in the wood is spatulate and the pupal cell lies longitudinal to the stem or inclined toward its surface. A layer of wood up to 30 mm thick, more often 2–5 mm, remains between the bark and the cell. Length of cell 5–6 cm, width 1.5–2.0 cm. Length of gallery in the wood 12–23 cm, width 1.5–2.0 cm. Length of gallery under the bark up to 26 cm, width 2–9 cm. In the wood of standing rooted trees, the pupal cell lies above the entry hole. Larvae pupate with their head toward the bark.

Pupation of larvae takes place after the second hibernation, from May to early July. Maximum pupae recorded in the second half of June. Pupae develop in two–three weeks. From a pupa formed on June 22nd in the forest, the beetle emerged on July 7th. In Altai in 1975, the first beetles appeared in the cells on June 4th and the last were found mid-July. After sloughing the pupal exuvia, a young beetle appears fully developed in five–seven days. It nibbles a round flight opening (4–8 mm diameter) on the surface of the stem, taking about four–seven days to do so. The beetle remains for a total of 9–14 days in the wood. After emergence, it feeds and then begins to reproduce. Maximum emergence of beetles from the wood observed June-end and during the first ten days of July. In the north and in high-altitude mountains, the emergence of beetles continues for one–two weeks. Generation—two-year cycle (Table 10).

The weight of larvae and beetles varies considerably. For example, based on 16 individuals, larvae before pupation weighed 225–870 mg (569.7

Table 10. Development of *Monochamus sutor* (L.)

Year	May	June	July	August	September	October
1st	LP	PAE	PAEL	AEL	AEL	L
2nd	L	L	L	L	L	L
3rd	LP	PAE	PAEL	AEL	AEL	L

± 46.3), pupae 204–793 mg (516.8 ± 41.8, beetles before emergence from cells 170–623 mg (418.5 ± 32.5).

Monochamus sutor (L.) appears in large numbers in spruce, cedar, and deciduous forests and in lesser numbers in fir and pine plantations. In the latter, it is replaced respectively by populations of *Monochamus urussovi* (Fisch.) and *M. galloprovincialis* (Oliv.).

Foci of mass breeding are formed in forests affected by fires and damaged by the Siberian silkworm (*Dendrolimus sibiricus* Tschetv.) as well as in plantations destroyed by unsystematic felling of trees.

92 2. **Monochamus galloprovincialis** (Oliv.)

Olivier, 1795. *Entom.*, 4, 67: 125 (*Cerambyx*); Plavil'shchikov, 1958. *Fauna SSSR*, 23, pt. 1: 519–524; Cherepanov and Cherepanova, 1973. *Nov. i maloizv. vidy fauny Sibiri*, 7: 60–62.

Adult (Fig. 42): Characterized by comparatively thick black body with bronze hue and somewhat rusty pubescence on shield and ventral side of body. Head on occiput coarsely striate, on frons with minute erasing punctation, adherent rusty hairs and narrow median longitudinal groove; inner to antennae with spiniform tubercle. Eyes large, broadly emarginate, sharply faceted. Antennae long, extending beyond apex of elytra by 5th (male) or 8th (female) segment. First antennal segment thick, almost half length of 3rd, with coarse compact striate punctation. Third and subsequent segments with compact granular (male) or very minute, simple, and very dense (female) punctation; basally segments with white pilose ringlets (female) or without them (male).

Pronotum transverse (female) or slightly oblong (male), laterally with conical tubercle, basally and apically with broad flange, disk convex, with transversely extended punctation, on flanges with thin transverse striae, with compact adherent yellow hairs forming more or less distinct cluster at base of lateral tubercles. Pronotal shield triangular, narrowly rounded posteriorly, with compact rusty or nearly rusty hairs, medially in posterior half with glabrous band. Elytra at humeri broad, convex, barely tapering toward apex, apically almost jointly rounded, in anterior third with deep bold striate punctation, in medial third with sparse deep, in posterior third

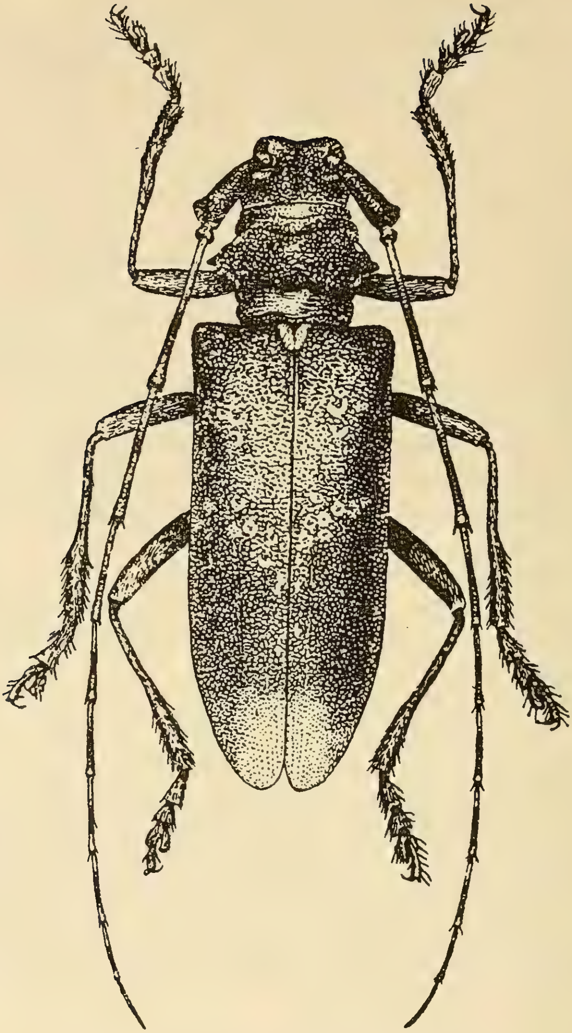


Fig. 42. *Monochamus galloprovincialis* (Oliv.).

dispersed erasing punctures, with short adherent gray and yellowish hairs forming beyond middle a broad, before hind clivus narrow transverse grayish or yellowish, indistinct, slightly projecting band. Forelegs of males
93 long, distinctly longer than midlegs, midtibiae on outer side beyond middle with acicular projection, distal to it with coarse brownish bristles forming brush. Body ventrally with dense rusty-bronze pubescence. Sternite V apically truncate or broadly emarginate, at angles with long bundle of

dense black hairs or broadly rounded, laterally here with long rarefied hairs not forming distinct bundle. Body, head, antennae, and legs black, elytra generally with bronze tone. Body length 12–27 mm.

Egg: White, elongate, toward caudal pole slightly tapering, here narrowly, on cranial pole gently rounded. Chorion with very fine, sharply cellular sculpture. Alveoli minute, deep, spaces between them barely less than alveoli per se. Length 3.5 mm, width 1.4 mm.

Larva (Fig. 43): Distinguished from all species of the genus *Monochamus* by absence of uneven whitish punctures on shield of pronotum. Head half retracted into prothorax. Epistoma weakly convex, rusty, only in posterior third whitish, at anterior margin with three long lateral bristles, medially with distinct longitudinal suture, laterally with barely perceptible frontal sutures, in anterior third with long bristles, of which three form lateral transverse row at level of antennae, and three pairs in three

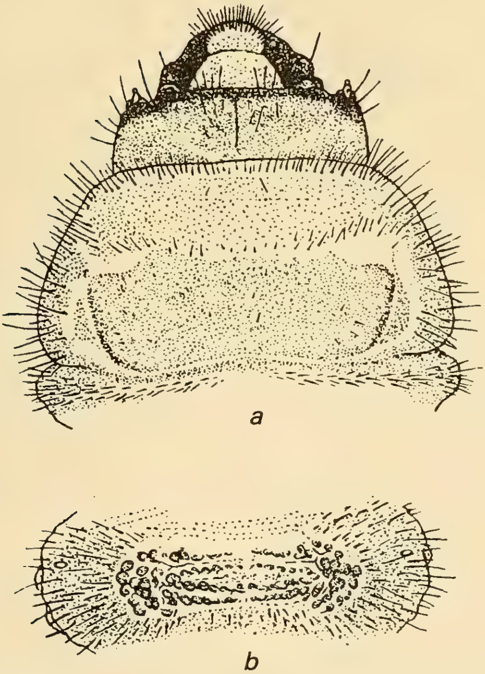


Fig. 43. Larva of *Monochamus galloprovincialis* (Oliv.).

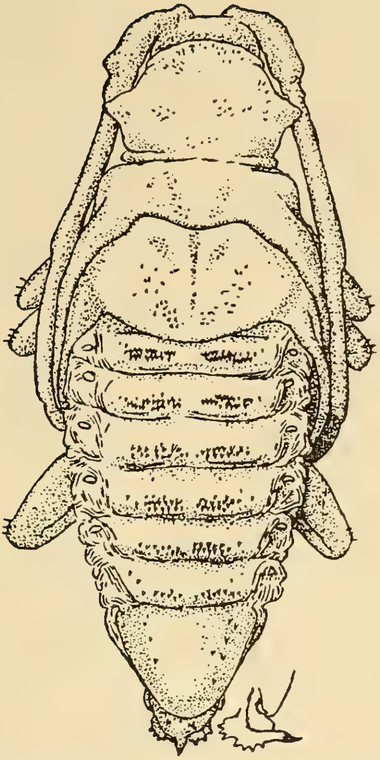
a—head and pronotum; b—abdominal tergite with dorsal locomotory ampulla.

rows: anterior row with adjacent bristles, medial row with longest, more dispersed bristles, and posterior row with shortest, still more dispersed, wide-set bristles. Hypostoma insignificantly convex, reddish-rust, at anterior angles narrowly rounded, in anterior half with thin transverse striae, here lateral to gular band with three bristles in transverse row. Gular band enlarged anteriorly, darkened. Temporo-parietal lobes rusty-red, in
94 posterior half on upper side whitish, in anterior half with long setiform hairs. Antennae short, conical, brownish. Ocelli near base of antennae small (ventral view), convex. Clypeus large, broad, insignificantly tapering anteriorly, somewhat rusty. Labrum rusty, apically broadly rounded, sharply tapering toward base, disk convex, in anterior half with dense bristles. Mandibles black on outer side basally without sharp longitudinal notches, apically with acute, produced ventral denticle.

Pronotum more tapering anteriorly, laterally in posterior half rounded, at anterior margin with rusty hairs forming transverse band (in which laterally four and medially one–two interlacing rows discernible). Behind this band lies yellowish glabrous lustrous square passing over laterad. Pronotal shield barely convex, yellowish-rust, sclerotized, without white punctures, with short solitary (dispersed) bristles, at anterior angles insignificantly sloping, laterally demarcated by short longitudinal grooves slightly diverging anteriorly and uniting with narrow transverse notches, which are edged in front by cluster of dense rusty hairs. Mesonotum medially with setiform hairs in transverse row. Metanotum medially divided by transverse groove, with faint ampullaceous granules coming closer to this groove. Prothoracic presternum with long rusty hairs, laterally with somewhat lustrous glabrous square. Eusternum convex, in anterior half with short hairs, in posterior half glabrous, matte. Base of prosternum (basisternum) laterally with dense hairs, disk glabrous, matte.

Abdomen elongate, laterally with dense hairs. Dorsal locomotory ampullae with ampullaceous, nonsclerotized spinules forming four transverse rows and one outcurved lateral row. Cluster of 9–10 granules present between transverse and lateral rows. Tergite IX transverse, posteriorly broadly rounded, disk glabrous, lustrous, in posterior third and laterally with long rusty hairs. Anal segment (apex) with numerous long rusty hairs. Ventral ray of anal pore half size of lateral rays. Body length of late instar larvae 45–60 mm, width of head 4.0–4.5 mm.

Pupa (Fig. 44): Characterized by presence of large spinules at tip of abdomen and other characters. Body broad. Head medially on frons and sinciput with deep longitudinal groove, paramedially in front of antennal bases with numerous styloid spinules forming one cluster at base of each antenna and near anterior (lower) ocular lobes; sometimes these clusters merge and form two longitudinal bands. At base of clypeus six spinules



93 Fig. 44. Pupa of *Monochamus galloprovincialis* (Oliv.).

form transverse row broadly interrupted medially. Upper ocular lobe (at base of antennae) with two large spinules. Labrum tapering anteriorly, apically somewhat narrowly rounded, basally along sides and at apex with large spinules forming three clusters. Antennae in second half spiraled, with almost two (female) or three (male) loops.

Pronotum transverse, basally with indistinct transverse groove, disk uniformly convex, laterally with large conically extended tubercle, with acute acicular or almost styloid spinules dispersed over entire surface or forming barely perceptible clusters. Mesonotum moderately convex, lustrous, at posterior margin with barely produced shield, with acute spinules forming two bands diverging from base of shield toward base of elytra. Meta-
95 notum insignificantly convex, posteriorly broadly rounded, medially with barely perceptible longitudinal groove, with minute acute spinules forming

two rarefied bands extending from longitudinal groove obliquely forward and toward alar base.

Abdomen moderately elongate, tapering toward tip from segment IV. Abdominal tergites in posterior half convex, with common median longitudinal groove, in anterior third with lateral transverse notch, at posterior convex margin with numerous acute spinules forming transverse band broadly interrupted medially; band with two–four rows of spinules. Abdominal tergite VII triangular, apically narrowly rounded, basally glabrous, convex, in posterior third with sparse minute acicular spinules. Tergite VIII semicircular, convex, with thin acicular spinules (2–10 spinules). Urogomphus large, conically produced, terminating in acute sclerotized spinule. Ridges bordering tip of abdomen laterally (ventral view) bear large sclerotized spinules not only on lower (ventral) side, but also on upper side at base of urogomphus. Valvifers of female small, slightly elongate, with apices curved toward each other. Body length 16–22 mm, width of abdomen 6–7 mm.

Material: Collected in eastern Ural region, Kulunda, Ob' region, and Altai. Adults 1,284, larvae 132, pupae 2 males and 5 females, larval exuviae with beetles and pupae from cells 3.

Distribution: Europe, northern Africa, Asia Minor, northern Asia including northern Kazakhstan, western and eastern Siberia, and northern Mongolia.

Biology: Ecologically associated with Scotch pine (*Pinus sylvestris*) plantations. Inhabits southern regions of western and eastern Siberia. Beetles fly from first ten days of July up to September inclusive. In the Ob' region, we found individual beetles even in early October. During the summer in different regions of southern Siberia, we caught 1,109 beetles—5.9% in June, 50.3% in July, 28.0% in August, 15.4% in September, and 0.4% in early October. Beetles emerging from sites of development fly to the canopy of mature, thick-stemmed pine trees, where they feed on the bark of thin shoots, which subsequently wither. About one–two weeks are spent on supplementary feeding. During this period their gonads mature. Sexually mature beetles begin to reproduce, often feeding intermittently. They mate in the crown or on the stems of trees. Then, using its mandibles, the female makes infundibular cavities (from 4.9 mm × 2.7 mm to 7.1 mm × 4.4 mm) in thick bark at a depth of 0.5 to 10 mm and through them lays eggs on the compact layer of sapwood. One egg is laid through each cavity. Beetles infest mainly the thin bark part of the stem. For example, in the forest, on five felled trees (20–36 cm diameter), we found 866 cavities—553 (63.8%) in thin bark, 218 (25.2%) in medium thick bark, and 95 (11%) in thick bark. Of these cavities, 185 were in the upper part, 376 in the southern, and 305 in the northern part (trees lay with their tops southward). Of the 243 cavities opened by us, 37 (15.2%) contained no eggs. This indicates that sometimes the female deserts the cavity it has made without laying an egg in it. From 1 to 21 minutes are required to make a cavity and 1 to 9 minutes for ovipositing; hence the act of oviposition requires 2 to 30 minutes (on average, up to 12 minutes). During this time the males remain near the females. In nature, the beetles live for six–eight weeks after emerging from the wood. A female can lay about 20 eggs during its life span. We found 17 fully developed eggs in the ovaries of two females caught in nature on July 10th and 29th.

96 Compared to *M. sutor* (L.) beetles, *Monochamus galloprovincialis* (Oliv.) beetles are quite resistant to the effect of direct sunrays. For example, if the former during the hot diurnal hours becomes heat numbed after 15 minutes due to the effect of sunrays, then the latter under the same conditions remains fully vitally active even after 20 minutes. This is because the grayish body color of *Monochamus galloprovincialis* (Oliv.) beetles facilitates less absorption of direct solar heat than the black color of *M. sutor* (L.) beetles.

Hatching of larvae begins by June-end or early July and continues up to September-end. Mass hatching is observed in August. Larvae live under the bark during the first summer and the beginning of the second summer, feed on the bast, and make sinuous galleries barely impressed on the sapwood. Length of gallery under the bark up to 15 cm or more, width 0.7–3.0 cm; sometimes gallery squarish. After the first hibernation, midinstar larvae bore into the wood and make a transverse spatulate gallery. They throw the frass out through ventilation holes. Larvae hibernate a second time in the wood. The following summer they make a cell at the end of the gallery transverse or longitudinal to the stem and close it behind (demarcate from the hollow gallery) with a plug of coarse fibrous frass. A layer of wood about 3.0 mm thick remains between the cell and the bark. Length of gallery in the wood 15–20 cm, width of entry hole 7–10 mm. Length of pupal cell 4.0 cm, width 1.5 cm. Larvae pupate in the same summer after the second hibernation.

Pupation of larvae begins in May and is completed by June-end or early July. Pupal stage lasts two–three weeks. Young beetles appear in the cells during the first ten days of June and their emergence from pupae continues up to mid-July. Developed beetles nibble round flight openings (4–8 mm diameter) on the stem surface and exit from the wood. Mass emergence of beetles from the wood is seen in July. Generation—two-year cycle (Table 11). Based on 19 individuals, larvae before pupation weighed 128–671 mg (380.2 ± 31.0), pupae 116–608 mg (339.9 ± 26.0), young beetles before emergence from cells 96–510 mg (282.1 ± 21.0).

Monochamus galloprovincialis (Oliv.) is found in large numbers in pine plantations of the southern Ob' region and in strip pine groves of

Table 11. Development of *Monochamus galloprovincialis* (Oliv.)

Year	May	June	July	August	September	October
1st	LP	LPA	PAEL	AEL	AEL	L
2nd-3rd	L	L	L	L	L	L
4th	LP	LPA	PAEL	AEL	AEL	L

Kulunda. It attacks physiologically weak and drying trees and large numbers infest freshly prepared wood and slashed remains (knots, logs up to 8.0 cm diameter) in logging areas as well as windfelled trees. The insect attacks both thick- and thin-stemmed trees but prefers the thin-barked region of the stem. The selfsame trees are coinfested by other species: *Pachyta quadrimaculata* (L.) on the roots, *Acanthocinus aedilis* (L.) mostly in the basal (underground) part of the stems, and *Pogonocherus fasciculatus* (Deg.) in the canopy on thin shoots. We observed it only on pine and no other plant species.

97 3. **Monochamus urussovi** (Fisch.)

Fischer, 1806. *Mem. Soc. Nat. Mosc.*, 1: 12 (*Cerambyx*); —*quadrimaculatus* Motschulsky, 1845. *Bull. Soc. Nat. Mosc.*, 18, 1: 86; —*rosenmülleri* Jacobson, 1910. *Horae Soc. Ent. Ross.*, 39: 500; Florov, 1938. *Nasekomye vrediteli khovoinykh nasazhdenii Vost. Sibiri*, 147–150; Tal'man, 1940. *Tr. Lesotekhn. Akad.*, 57: 59; Tal'man, 1948. *Ibid.*, 63: 152; Plavil'shchikov, 1958. *Fauna SSSR*, 23, pt. 1: 510–513; Prozorov, 1958. *Tr. Sib. lesotekhn. in-ta*, 21: 15–115; Cherepanov and Cherepanova, 1973. *Nov. i maloizv. vidy fauny Sibiri*, 7: 58–60.

Adult (Fig. 45): Well distinguished from other species of this genus by dense bright hairs imparting a vivid hue to the hind clivus of the elytra, flat, entirely and densely covered shield, and other characters. Body comparatively large. Head with moderate, not very dense, sometimes evanescent punctation, near base of antennae on inner side with highly (male) or insignificantly (female) produced tubercle, medially between antennae with deep narrow (male) or broad gentle (female) longitudinal trough. Antennae 2.0–2.5 times longer than body (male) or barely (by 10th–11th segment) extending beyond apex of elytra (female). First antennal segment thick, with coarse compact punctation, apically on outer side with sharply demarcated semicircular mark.

Pronotum not longer or barely longer than its basal width, in anterior third and basally with distinct flange, here generally transversely striate, disk with uneven, sometimes faint punctation, laterally with highly extended conical tubercle. Pronotal shield flat, posteriorly broadly rounded, entirely covered with dense whitish or yellowish hairs.

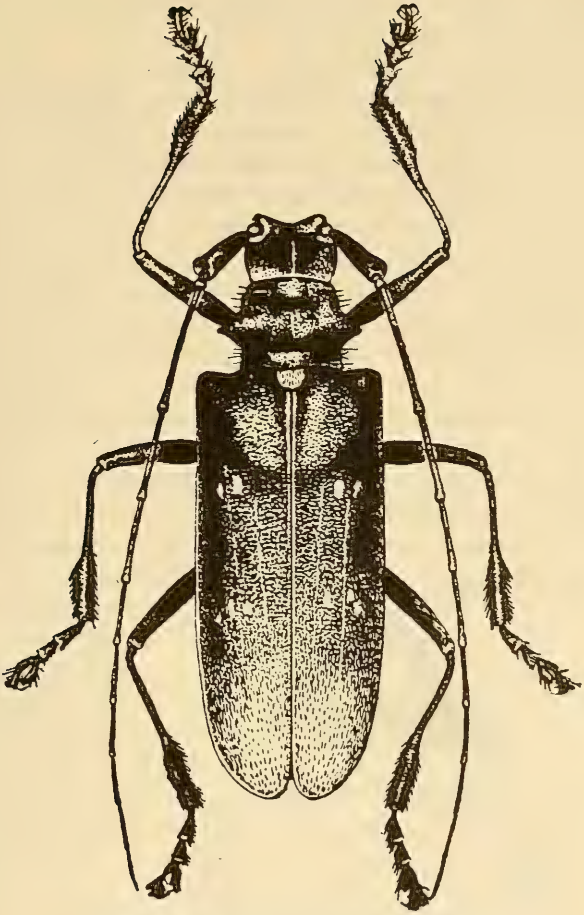


Fig. 45. *Monochamus urussovi* (Fisch.).

Elytra elongate, parallel-sided (female) or markedly tapering toward apex, at latter jointly rounded, convex, in anterior half with transverse notch, before this notch with bold compact, and in front minute punctation, with short sparse, on hind clivus dense gray hairs, imparting here whitish tinge to common black background. Body ventrally with short white adherent and long brownish semierect hairs not forming continuous pubescence. Legs long, femora uniformly insignificantly thickened, hind tarsi two-third (male) or one-half (female) length of tibiae. Body, antennae, and legs black; elytra 98 black, disk with uneven white pilose spots (female) or without them (male), hind clivus with whitish or slightly rusty tinge. Body length 18–37 mm.

Egg: White, elongate, slightly curved, narrowly rounded at poles. Chorion matte, with fine, dense, reticulate (almost punctate) sculpture. Length 4.2–4.8 mm, width 1.2–1.4 mm.

Larva (Fig. 46): Similar to the larva of *Monochamus sutor* (L.). Distinguished from it by location of bristles at anterior margin of pronotum, which form here a comparatively uniform transverse band, and by small spiracles on abdominal segments. Head parallel-sided, moderately flat. Epistoma barely convex, laterally with faint frontal sutures, medially with longitudinal suture, in anterior half rusty, here with long and short bristles, at anterior margin with three lateral bristles in transverse row. Hypostoma convex, rusty-brown, with steeply rounded anterior angles. Temporoparietal lobes at anterior margin with dark brown fringe, here behind antennae with long setiform hairs forming narrow transverse band. Antennae short, projecting from antennal socket by one or two segments. Clypeus large, trapezoid, laterally with two–three short, barely perceptible bristles, basally somewhat rusty. Labrum in anterior half convex, whitish, with dense rusty bristles, at anterior margin rounded, tapering toward base, here glabrous, rusty, laterally with black spot. Mandibles black, on outer side basally with pair of deep longitudinal notches, each bearing one–four bristles, apically truncate, with elongate ventral denticle.

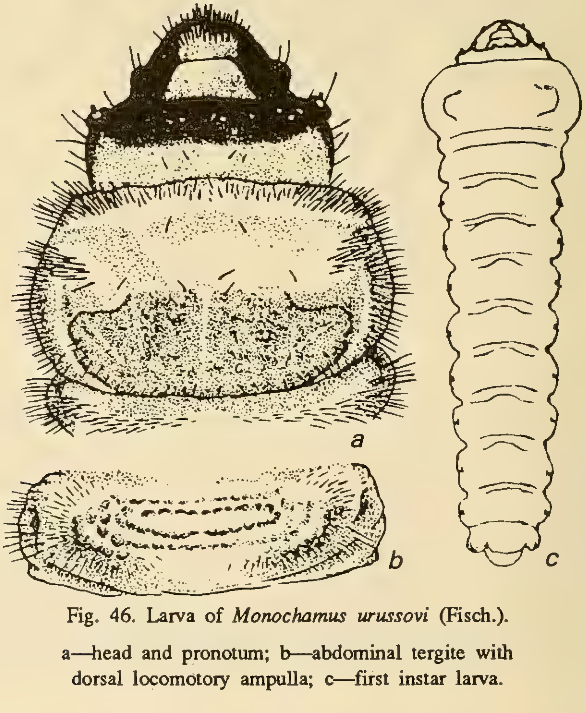


Fig. 46. Larva of *Monochamus urussovi* (Fisch.).

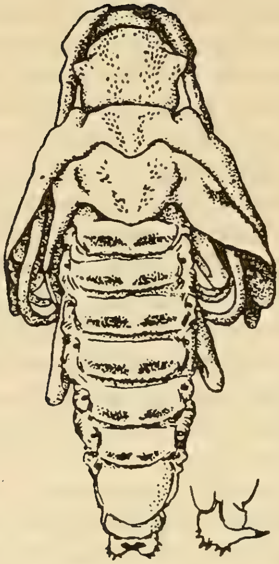
a—head and pronotum; b—abdominal tergite with dorsal locomotory ampulla; c—first instar larva.

Pronotum insignificantly sloping toward head, in anterior fourth whitish, along posterior margin of whitish fringe with dense, somewhat rusty, setiform hairs forming comparatively uniform transverse band (in *M. sutor* (L.) hairs in middle form only one row), behind band with lustrous yellow square having on disk pair of wide-set bristles. Pronotal shield yellowish-
99 rust, sclerotized, with dense minute sclerotized spinules, anterior angles emarginate with short rusty bristles in transverse row basally and two indistinct longitudinal curved bands collectively forming in some specimens a longitudinally extended ellipse. Shield laterally demarcated by longitudinal grooves, at anterior angles by transverse triangular notches, outer to which with dense setiform hairs forming longitudinal band that curves in front of transverse notches at an acute angle. Prothoracic presternum in anterior half with setiform, uniformly rusty hairs, in posterior half laterally with large glabrous lustrous rusty square demarcated on sides by dense rusty hairs. Eusternum basally glabrous, in anterior half with short hairs.

Abdomen elongate, laterally with dense rusty hairs. Dorsal locomotory ampullae convex, with large granules forming four transverse and one lateral longitudinal outcurved row. On sides, between these transverse rows and lateral longitudinal row, lies a cluster of 7–10 granules. Granules with minute grains visible under high magnification. Ventral locomotory ampullae with granules forming two rows curving backward that are laterally more pushed apart, medially adjacent. Therefore, ampullae in middle seem to be intercepted. Anal segment (apex) small; anal lobes on outer side with large dense rusty hairs. Body white. Body length of last instar larvae 55–60 mm, width of head 4.5–6.0 mm.

Pupa (Fig. 47): Distinguished from the pupa of the closely related species *Monochamus sutor* (L.) by much larger spinules at tip of abdomen. Body large. Head more (male) or less (female) elongate, near base of antennae with produced tubercle, medially with deep narrow (male) or broad (female) longitudinal trough, laterally in front of antennae with numerous acicular spinules forming broad longitudinal band on each side, beyond antennae with individual spinules, occiput glabrous, broadly rounded. Antennae flexed laterad, extending beyond midfemora, passing ventrad, and spiraled here, forming three (male) or two (female) loops.

Pronotum transverse, in anterior third with distinct broad flange, basally with narrow transverse groove, disk convex, smooth or, in some specimens, transversely striate, medially with narrow, barely perceptible longitudinal groove, laterally with large elongate triangular conical tubercle, with acute short spinules forming narrow transverse band or interlacing transverse row at anterior margin before flange, in remaining part unevenly dispersed or individual faint clusters. Pronotum laterally with short acicular



98 Fig. 47. Pupa of *Monochamus urussovi* (Fisch.).

spinules as well as long thin bristles. Mesonotum at posterior margin with elongate shield, rounded posteriorly, in front of shield with transverse depression, with numerous short acute spinules forming distinct band extending from base of elytra toward apex of shield. Metanotum broad, slightly convex, posteriorly broadly rounded, medially with distinct transversely flaring longitudinal groove, with short acute spinules forming two bands extending obliquely from anterior angles toward middle of posterior margin. At anterior end of these bands long solitary bristles occur among spinules. Femora on outer side with 7–11 acicular spinules forming transverse row apically.

Abdomen elongate, almost parallel-sided, gradually tapering from segment VII (female) or from base (male) toward tip, dorsally with median longitudinal groove. Abdominal tergites convex, in anterior half with lat-
100 eral transverse notch, in posterior half raised, here with dense acute styloid spinules directed backward and forming transverse band interrupted medially. Abdominal tergite VII triangular, posteriorly narrowly rounded, disk convex, lustrous, in posterior third with minute acute spinules, in front glabrous or with individual minute setiform spinules. Tergite VIII with very minute thin bristles forming interlacing transverse row or transverse band. Tip of abdomen with large urogomphus, dorsally elongate, and terminating in long sclerotized, very acute spinule. Ridges at tip of abdomen

(ventral view) highly projecting, with numerous sclerotized spinules (in *M. sutor* (L.) these spinules not many and minute). Valvifers of females small, spherical, tapering toward base, rounded apically, here with small, barely perceptible tubercle. Body length 24–35 mm, width of abdomen 7–12 mm.

Material: Collected in the forests of western and eastern Siberia, on Sakhalin and Kunashir. Adults 1,923, larvae 93, pupae 24, larval exuviae with beetles from cells 12.

Distribution: Inhabits coniferous forests within the boundaries of the Soviet Union, Finland, northern Mongolia, northern China, North Korea, northern Japan (Hokkaido). In the north penetrates up through the range of coniferous forests. Specimens were also collected in the Tara River region.

Biology: Infests coniferous plantations, ascends in mountains to 1,500 m, but individuals were found at an altitude of 2,000 m above mean sea level. Once found at this altitude in Kolyushu near Lake Telets. In the north, penetrates the polar tundra together with coniferous plantations. Flight of beetles begins by May-end to early June and continues up to the last ten days of September. Maximum beetles observed in July. In systematic collection in Altai during the season, we collected 1,177 beetles—15.9% in June, 72.9% in July, 8.1% in August, and 3.1% in September. Beetles had disappeared by September-end. In other regions, we collected 662 beetles—0.6% in May, 18.2% in June, 59.6% in July, 20.4% in August, and 1.2% in September. Beetles emerge from sites of development with underdeveloped gonads and require supplementary feeding. At this time they fly to the canopy of trees and nibble the bark of young, thin, growing shoots of fir, spruce, cedar, and other coniferous woody species. In Altai, they partially damage the shoots of birch. According to the observations of Prozorov (1958), a beetle during its life span can eat bark on the shoot surface varying in area from 4,465 to 9,423 mm^2. During the warm period of the year (July, first half of August), the beetles feed incessantly for 24 hours of the day, but at the end of August and in September, they mainly feed during the day. Shoots damaged by the beetles generally wither. On average, the beetles live up to two months. During this period, they resume supplementary feeding several times. One week or slightly more after emergence from the pupal cells, they mate and the females begin to lay eggs, settling on trees of coniferous species. For oviposition, using its mandibles, the female nibbles a rimiform abrasion (makes a cavity) on the bark, then turns 180°, introduces its ovipositor into the cavity, and lays an egg under the bark. One egg is laid per cavity, rarely two eggs. Sometimes the cavities are not utilized and remain empty. For example, in Altai, on cutting the bark, we found that of the 254 cavities made by females on the stems of fir (*Abies sibirica*),

eggs had been laid in 190 (74.4%) only; in another instance, of the 320 cavities made on the stems of cedar (*Pinus sibirica*), only 260 (81.2%) contained eggs. The remaining cavities were empty, without eggs. This phenomenon was observed in other regions as well. In felled trees, cavities are mainly made in the lower part or on the sides. The upper part is rarely infested. Stems of standing, rooted trees are infested over the entire circumference and the southern portion is infested notably more densely
101 than the northern. Stems 16–40 cm or more in diameter are susceptible to infestation. Females oviposit on physiologically weak and freshly felled trees. They do not infest dead trees. During its life span, a female can lay 9 to 20 eggs. On dissection, 15 eggs were found in the ovaries of one female and 20 eggs in another. Egg development lasts in nature from 2.5 to 4.0 weeks. In Altai, under forest conditions with an average diurnal temperature of 15.9–16.5°C, the egg stage lasts from 16 to 30 days (average 18.8 ± 0.1). We kept 310 eggs under observation. Hatching of larvae begins by June-end to July and continues up to September-end. Mass hatching of larvae from eggs occurs in July and August.

The larva breaks the chorion and gradually bores into the bark. It initially lives in or under bark and makes a sinuous, sometimes squarish, expanding gallery weakly impressed on the wood. Width of gallery under the bark 2.0–2.5 cm. After hibernation, the larva bores into the wood, leaving an oval entry hole (15 mm × 6 mm to 17 mm × 7 mm) on the surface longitudinal to the stem. In this process, it throws out fibrous frass through the ventilation hole. The gallery is initially transverse, then steeply, almost at a right angle, becomes longitudinal in the upper layer of the wood. In the blunt part of the longitudinal gallery, the larva makes a cell, demarcating it behind by a plug of coarse fibrous frass. The length of one transverse gallery in wood was 15 cm, plug 5.5 cm, and pupal cell 6.5 cm; width of cell 2.0 cm. The larva pupates in the cell with its head toward the side opposite to the plug. The layer of wood between the anterior surface of the cell and the bark varies from 2.0 to 5.0 mm.

Pupation of larvae begins after the second hibernation, during the last ten days of May, and continues up to July. Pupae are found up to mid-July but observed solitarily even at the end of this month. On Kunashir, we found the first pupae on May 26th and the last pupae in the last week of July. In Altai in 1975, the first pupae were found on May 29th and the last mid-July. Maximum pupae observed June-end or early July. Pupae develop in about four–five weeks. For example, from a larva pupated on June 6th, the beetle developed on July 4th. Another pupa appeared on May 29th and the beetle developed from it on July 7th. The atmospheric temperature during this period varied from 2.1°C in the morning to 29°C later in the day, average 15.1°C.

102 **Table 12. Development of *Monochamus urussovi* (Fisch.)**

Year	April	May	June	July	August	September	October
1st	L	LPA	LPAE	LPAE	PAEL	AEL	L
2nd	L	L	L	L	L	L	L
3rd	L	LPA	LPAE	LPAE	PAEL	AEL	L

Emergence of beetles from pupae begins in mid-June and continues up to the first ten days of August inclusive. Adults appear even at the end of May. Maximum emerging beetles recorded in the last ten days of June. Developed beetles remain in the cells up to seven–eight days and then nibble a round opening (6–12 mm diameter) on the bark surface and exit the pupal cell through it. The emergence of beetles from the wood is quite a protracted process. The earliest beetles emerge at May-end or in June and the latest in July–August. Mass emergence takes place in July.

Based on 40 individuals, weight indices characteristically show that the larvae before pupation weigh 265–2,750 mg (1,225.9 ± 111.5), pupae 194–2,500 mg (1,102.5 ± 100.4), young beetles before emergence from the wood 165–1,670 mg (879.7 ± 76.8). Generation—two-year cycle (Table 12); deviations from this pattern are rare.

Monochamus urussovi (Fisch.) inhabits coniferous forests of different species composition. Maximum damage is caused to fir, particularly to deciduous, cedar, and spruce plantations. The insect is found in lesser numbers in pine forests, where it is replaced by *Monochamus galloprovincialis* (Oliv.). Mass breeding of *M. urussovi* (Fisch.) takes place in
102 forests damaged by cone-eating insects (*Dendrolimus sibiricus* Tschet., *Boarmia bistortata* Goeze, and others) and rarefied by tree felling or forest fires. Wood damaged by the larvae loses its commercial qualities and becomes unsuitable for industrial and technical requirements. In some stray instances, this species infests birch but the damage done to birch forests is minimal.

4. **Monochamus grandis** Waterh.

Waterhouse, 1881. *Trans. Ent. Soc. Lond.*, 431; Bates, 1884. *Journ. Linn. Soc. Lond. Zool.*, 8: 238; Kojima and Okabe, 1960. *Food Plants of Jap. Cerambycidae*, 36–37, 151; Kojima and Hayashi, 1969. *Insects' Life in Japan*, 1: 125; Krivolutskaya, 1973. *Entomofauna Kuril'skikh ostrovov*, 106–107.

Adult (Fig. 48): Close to *Monochamus urussovi* (Fisch.). Well distinguished from it by dense yellow or grayish pilose spot on pronotum at base of lateral tubercles, narrow longitudinal glabrous band medially

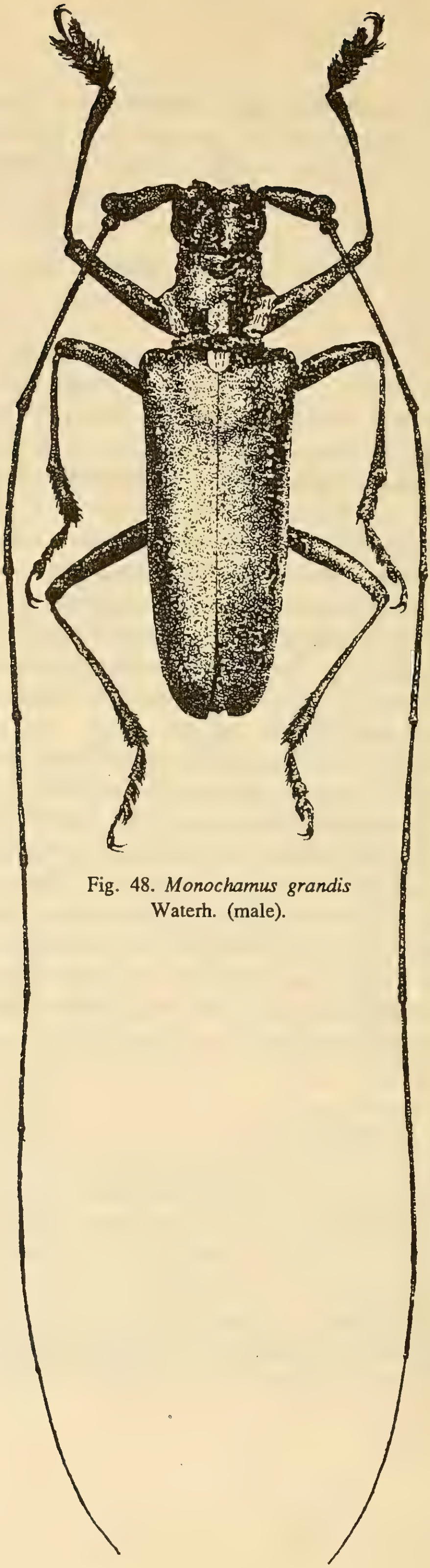


Fig. 48. *Monochamus grandis* Waterh. (male).

on shield, and absence of whitish tinge on hind clivus of elytra. Body large, elongate. Head with coarse striate uneven punctation, medially with narrow longitudinal groove, near base of antennae with highly (male) or slightly spiniform, extended tubercle. Eyes broadly emarginate, upper ocular lobe barely broader than lacertus between it and lower lobe. Antennae 2.3 (male) or 1.1 (female) times longer than body, extending beyond apex of elytra by 5th (male) or 10th (female) segment. First antennal segment with compact striate punctation, apically on outer side with semicircular area (cicatrix) demarcated by sharp ridge; beginning with 3rd segment with bold granular (male) or minute (female) punctation; segments basally with bright pilose ringlets (female) or without them (male).

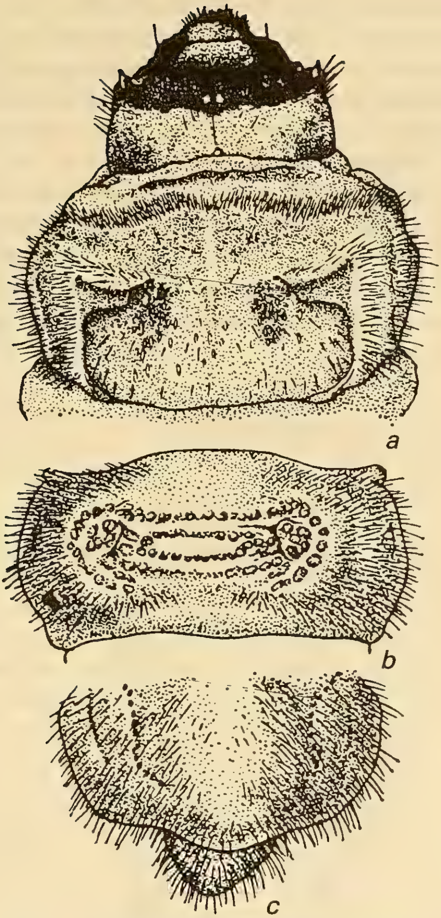
Pronotum in basal width not less (female) or slightly less (male) than in length, near anterior margin with broad, near posterior margin with narrow distinct flange, disk convex, medially in front of posterior flange with more (female) or less (male) distinct tubercular prominence, laterally with acute spiniform tubercle, with compact, not very bold punctation, on flanges without transverse striae, with minute grayish or somewhat rusty adherent hairs forming one large spot near base (posteriorly) of each lateral tubercle; sometimes two additional round spotlets occur on disk near anterior flange. Pronotal shield insignificantly elongate, basal width not more or even less than length, with dense adherent yellowish hairs, medially with narrow glabrous longitudinal band, which is lustrous due to more rarefied pubescence here.

Elytra convex, elongate, without transverse notch, parallel-sided (female) or slightly tapering toward apex (male), apically jointly rounded, with very acute (straight, male) or slightly rounded (female) inner angle, with barely projecting humeral tubercle, in anterior fourth with bold, in remaining part evanescent, barely perceptible punctation, with very minute, compact adherent gray or yellowish hairs forming medially and in front of 103 hind clivus barely perceptible, slanting bands extending from suture laterad. Sometimes these bands are absent, sometimes individual grayish specks present, or elytra entirely black, without specks. Legs long, femora uniformly thickened, foretibiae in males somewhat longer than midtibiae, foretarsi broad, laterally with long dense black hairs; in females foretibiae not longer than midtibiae, foretarsi not enlarged, laterally without long black hairs. Body ventrally with tender adherent hairs forming spotlike cluster near posterior angles of metasternum and laterally on prosternum. Sternite V in females broadly emarginate apically, with long dense black hairs forming here lateral brushlike cluster, in males rounded, without long black hairs. Body length 38–44 mm.

Larva (Fig. 49): Very close to larva of *Monochamus urussovi* (Fisch.). Distinguished from it by different number of bristles laterally at anterior

margin of epistoma, on hypostoma, and laterally on clypeus. Body of last
instar larva large, long. Head almost half retracted into prothorax, epistoma
flat, at anterior margin with one long lateral bristle, laterally fusing with
temporo-parietal lobes (frontal sutures not perceptible), medially with
groovelike longitudinal suture, in anterior half rusty-dark brown or almost
black, here sometimes striate, with long and short bristles, in posterior
half bright rust with pair of wide-set bristles. Hypostoma dark rust or
dark brown, at anterior margin broadly emarginate, with produced, very
acute anterior angles, in anterior half with bristles forming interlacing row
(in *M. urussovi* (Fisch.) sometimes with solitary, barely perceptible bristles,
more often without them). Temporo-parietal lobes reddish-rust, at
104 anterior margin in anterior half with long sparse hairs. Antennae short,
apically somewhat rusty, basally bright. Clypeus in posterior half rusty,
in anterior half insignificantly white, laterally with two–four bristles forming
cluster. Labrum at anterior margin broadly rounded, tapering toward
base, in posterior half glabrous, rusty, in anterior half and laterally in
posterior half with dense rusty bristles, slightly whitish. Mandibles
massive, apically obliquely truncate, on inner side with longitudinal well-developed
ridge uniting with apex of ventral denticle, on outer side near
base with two short longitudinal dents, with one dorsal and three ventral
bristles.

Pronotum twice wider than long, laterally broadly rounded, gently
sloping toward head, in anterior fourth dull white, sclerotized, here along
posterior margin with short dense rusty, basally edged setiform hairs forming
transverse band barely enlarging laterad; behind this band with glabrous
lustrous rusty mark passing laterad. This mark with deep bold uneven
punctation, on disk with pair of wide-set bristles. Pronotal shield convex,
somewhat rusty, sclerotized, with minute compact spinules, in posterior
half with longitudinal striae, in anterior half with uneven, fusing white punctures
105 forming two longitudinal ellipses, with short dispersed bristles, at
anterior angles deeply and obliquely emarginate, medially in anterior half
with longitudinal, barely perceptible groove, laterally demarcated by short
deep groove uniting anteriorly with flat transverse triangular notch. This
notch in front and outer to dorsal groove fringed with dense rusty hairs
forming longitudinal band incurved at an acute angle in front. Mesonotum
in anterior half sclerotized, behind sclerotized band with rusty hairs forming
narrow transverse band. Metanotum with two transverse medial rows
of sclerotized granules, behind them with rusty hairs forming narrow transverse
band. Prothoracic presternum with dense uniform rusty hairs, laterally
with somewhat rusty glabrous mark. Eusternum convex, well
demarcated by groove, in anterior half with dense rusty hairs, in posterior
half glabrous, coriaceous.

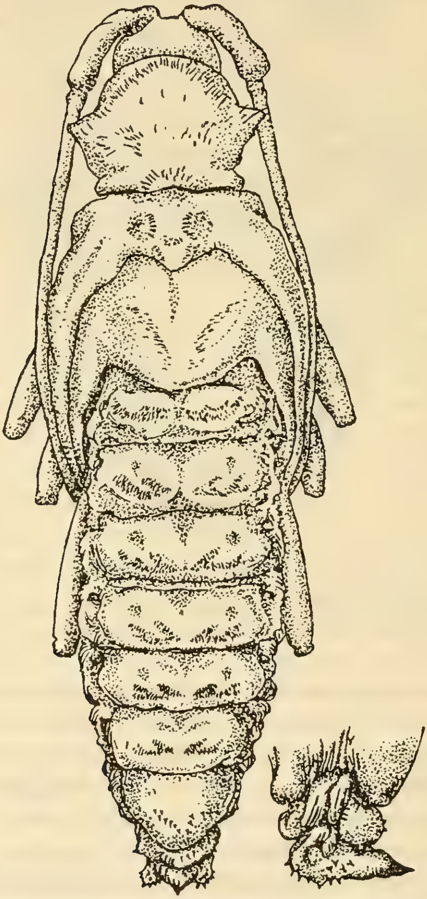


104 Fig. 49. Larva of *Monochamus grandis* Waterh.

a—head and pronotum; b—abdominal tergite with dorsal locomotory ampulla; c—tip of abdomen (dorsal view).

Abdomen elongate, laterally with short rusty hairs, Spiracle of abdominal segment II two-thirds size of spiracle of abdominal segment I and nearly one-third size of mesothoracic spiracle (in *M. urussovi* (Fisch.) difference in size of these spiracles very small). Dorsal locomotory ampullae with minute sclerotized granules forming four transverse rows and one longitudinal spatulate row on each side. Between these transverse rows on one side and spatulate row on the other side lies a cluster of 10–12 granules. Ventral locomotory ampullae anteriorly angularly emarginate and divided by deep transverse groove bent backward at an obtuse angle, with numerous granules forming in front of transverse groove two–three interlacing rows and behind it one row uniting laterally with zigzag oblique lateral row. Anal pore triradiate, lower (vertical) ray one-half to two-fifths size of horizontal rays. Body length of late instar larvae 65–82 mm, width of head 7.2–8.0 mm.

Pupa (Fig. 50): Characterized by large massive body and barely perceptible bristles on abdominal tergite VIII. Head retracted, frontally flat, here with short acicular spinules or bristles forming individual clusters, near base of antennae with an extended tubercle, medially between antennae with narrow deep (male) or broad, more gentle (female) longitudinal trough. Labrum elongate, slightly convex, apically rounded, with long dense



104 Fig. 50. Pupa of *Monochamus grandis* Waterh.

(male) or short acicular (female) bristles. Occiput broadly rounded, glabrous. Antennae long, thin, flexed laterad, on ventral side spiraled, forming four (male) or 1.5 (female) loops.

Pronotum transverse, in anterior third with broad transverse flange, near posterior margin with narrow transverse groove, laterally with large conical tubercle, disk convex, medially with barely perceptible longitudinal groove, at anterior margin before flange with minute spinules forming not fully distinct transverse band, laterally and on posterior side of lateral tubercles with thin bright hairs. Mesonotum beyond middle transversely depressed, posteriorly with extended, slightly raised shield, with acicular spinules forming two longitudinal bands bent forward toward base of elytra, here with long bright bristles forming distinct bundle. Metanotum barely convex, medially with transversely flaring longitudinal groove, with acicular spinules or long bright bristles jointly forming two bands diverging from middle of posterior edge toward anterior angles. These bands consist of spinules in posterior half, of bristles in anterior half. Femora on outer side with very thin apical spinules forming transverse band or small cluster.

106 Abdomen elongate, gradually tapering from base toward tip (male) or slightly expanding in region of tergite III. Abdominal tergites with common narrow median longitudinal groove, before middle insignificantly depressed laterally, in posterior half convex, here with numerous acute spinules forming transverse band broadly interrupted medially, with notch at anterior margin on each side of interspace. Tergite VII triangular, length not more than basal width, posteriorly narrowly rounded, in posterior half with minute acute spinules. Tergite VIII transverse, convex, lustrous, glabrous or with barely perceptible solitary bristles. Urogomphus at tip of abdomen large, highly extended, terminally with very minute acute sclerotized spinule (in *M. urussovi* (Fisch.) this spinule large, much longer). Ridges at tip of abdomen (ventral view) with minute spinules. Valvifers of female spherical, highly tapering toward base, apically with projecting tubercle, wide-set, distance between them almost not less than width of valvifers. Body length 43–49 mm, width of abdomen 6.5–7.5 mm.

Material: Collected on Kunashir Island. Adults 9, larvae 15, pupae 4 males and females, larval and pupal exuviae with beetles from cells 4 each.

Distribution: Kuril' islands (Kunashir, Shikotan); Japan (Hokkaido, Honshu, Shikoku, Kyushu).

Biology: Belongs to the group of endemic insular species and infests coniferous plantations. Flight of beetles observed in July–August and concludes in the first half of September. During the breeding season, beetles are found on stems of drying and freshly felled (windfelled) trees. Females nibble deep cavities in bark and oviposit through them under it. Larvae hatch from the eggs the same summer, live under bark, feed on bast, make uneven galleries longitudinal to the stem, and fill them with fine frass. Young larvae remain in these galleries for the first winter. After hibernation, they sometimes make expanding (squarish), sometimes tapering galleries under the bark, weakly impressed on sapwood. Width of gallery under bark 2.5–9.0 cm. Larvae of late instars, before second hibernation, bore into wood leaving slitlike entry holes (70 mm × 10 mm) on the surface. In wood, the larva initially makes a gallery transverse to the stem at a depth up to 9.0 cm, then longitudinal to it, and throws out coarse frass through the single ventilation hole made in the bark opposite the entry hole into the wood. Gallery in wood hollow, not packed with frass, and hence the larva moves freely in it. It remains in wood for a second hibernation. The last instar larva, after the second hibernation, makes a pupal cell in the outer layer of wood, generally longitudinal to the stem, rarely oblique, and closes it off from the hollow gallery with a plug of coarse fibrous frass (length of fibers 20–30 mm, thickness up to 1.2 mm). Length of larval gallery in wood not more than 30 cm, width near cell 2.7 cm. Length of pupal cell 8.0–8.5 cm, width 3.0–4.5 cm.

Pupation commences in June and is concluded in the first half of July. Pupae are found almost up to mid-August. Under a temperature that regularly fluctuates from 10 to 26°C (average, 16.3 ± 0.4°C), the pupal stage lasts four–five weeks. From pupae developed on June 26th, beetles emerged on July 27th, August 1st, and August 3rd. Developed beetles nibble large round openings on the stem surface, emerge through them, and commence breeding the same summer. Weight indices for seven individuals: larvae before pupation 2,211–4,190 mg, pupae 2,010–3,810 mg, beetles before emergence from cells 1,670–2,990 mg. Individual larvae prior to pupation weigh 5,580 mg.

107 We found *Monochamus grandis* Waterh. only on fir (*Abies sachalinensis*). According to Kojima and Okabe (1960), it damages several species of *Abies*, *Picea*, *Tsuga*, and other conifers. In one log of fir (diameter up to 69 cm, length 3.7 m), we found six beetles, three pupae, and two larvae. Even with such comparatively low population density, the wood was deeply pierced with larval galleries and had lost its technical-industrial qualities.

5. **Monochamus saltuarius** Gebl.

Gebler, 1830. *Ledebour Reise*, 2, 3: 184; Florov, 1938. *Nasek. vredit. khvoin. nasazhd. Vost. Sibiri*, 150; Tal'man, 1947. *Tr. Lesotekhn. Akad.*, 61: 123; Gressit, 1951. *Longic. Beetles of China*, 2: 395; Plavil'shchikov, 1958. *Fauna SSSR*, 23, pt. 1: 525–526; Kojima and Hayashi, 1969. *Insects' Life in Japan*, 1: 127; Cherepanov and Cherepanova, 1973. *Nov. i maloizv. vidy fauny Sibiri*, 7: 65–67.

Adult (Fig. 51): In sculpture of elytra closer to *M. impluviatus* Motsch., but well distinguished from it by much longer antennae, and from other species distinguished by coarse punctation only at base of elytra. Head with minute compact rugose punctation and yellowish-gray adherent hairs, very narrow median longitudinal groove, inner to base of antennae with more or less produced, finely punctate tubercle, sinciput medially between upper ocular lobes with barely perceptible, yellowish, slightly translucent spotlet. Eyes finely faceted, broadly emarginate. Antennae extending beyond

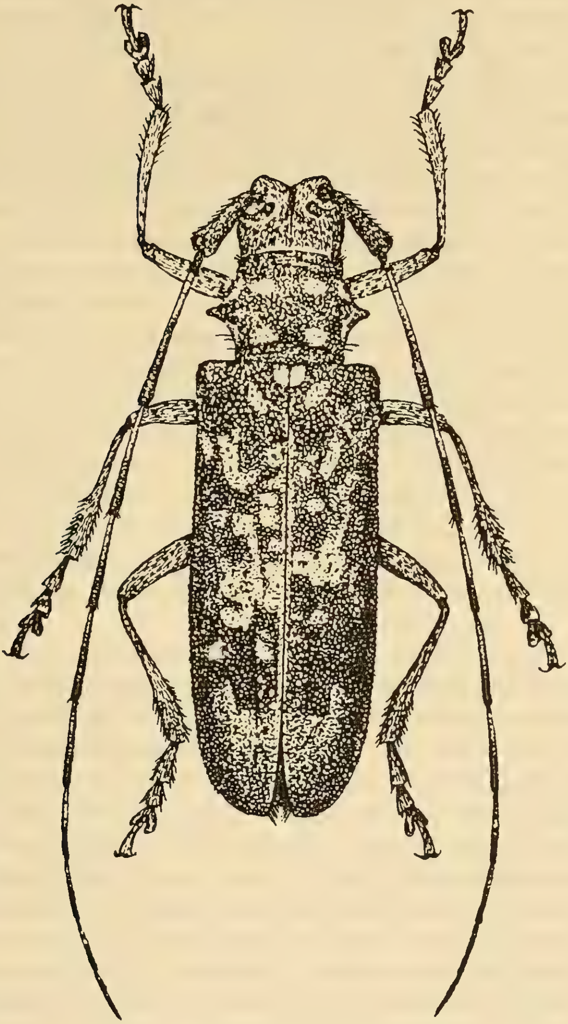


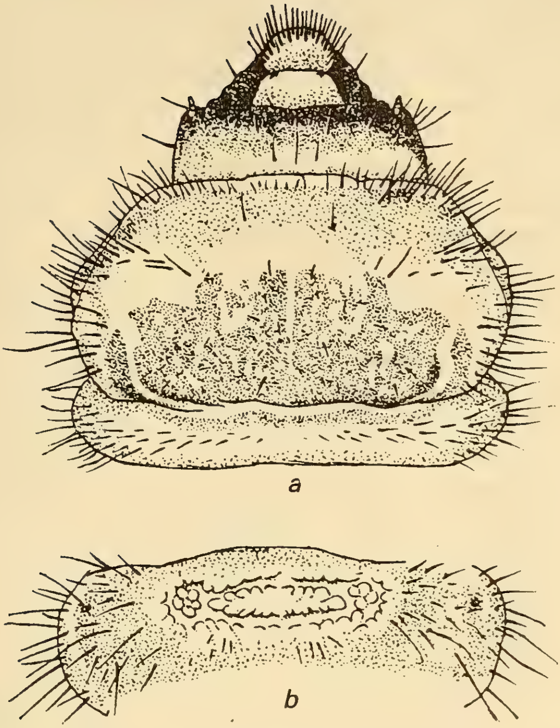
Fig. 51. *Monochamus saltuarius* Gebl.

apex of elytra by 8th (female) or 6th (male) segment, with thin simple (female) or granular shagreen (male) punctation; segments basally with broad whitish pilose ringlet (female) or without it (male).

Pronotum transverse (female) or almost oblong (male), in anterior third and near base with broad flange, laterally with large conical, sometimes more extended tubercle, disk convex, with dense rugose punctation, on flange with thin transverse striae, with yellowish adherent hairs forming two spots on fore- and hind clivus, one spot near base of each lateral tubercle (anterior spots always more, posterior spots less distinct). Pronotal shield flat, posteriorly broadly rounded, with dense, somewhat rusty hairs, medially with glabrous longitudinal band or without it (in which case, entire shield densely pilose). Elytra parallel-sided (male) or from base slightly enlarged posteriorly (female), apically separately rounded, sloping at outer angles more, at inner less, disk convex, basally with coarse flat, transversely extended punctation, in remaining part with fine sparse punctures, with short, compact adherent brownish and bright yellowish-gray or white hairs forming on common brownish background bright grayish or yellowish-gray spots, with well-manifest tendency toward formation of broad transverse band medially. Forelegs of males not longer than midlegs, midtibiae on outer side with gentle distal notch bearing short brownish bristles forming compact brush. Body ventrally with short yellowish-gray adherent and long thin semierect hairs. Abdominal sternite V short, apically emarginate, at posterior angles with long dense hairs forming cluster on each side (female) or rounded, with uniform brownish bristles (male). Body, antennae, elytra, and legs black. Body length 13–19 mm.

Egg: White, elongate, almost parallel-sided or slightly tapering toward one pole, at poles broadly rounded. Chorion matte, with fine distinct compact cellular sculpture. Spaces between alveoli narrow, brownish, septile. 108 Length 3.0–3.5 mm, width 0.8–1.2 mm.

Larva (Fig. 52): Characterized by three bristles laterally at anterior margin of epistoma, nonsclerotized lustrous granules of locomotory ampullae, and other features. Head flat, half retracted into prothorax. Epistoma in anterior half reddish-rust, barely convex, in posterior half bright, flat, at anterior margin laterally with three long bristles, on each side of longitudinal suture with pair of staggered bristles (inner bristle slightly in front of lateral), near antennal socket with three bristles in transverse row, on disk with two bristles in transverse row. Medial suture distinct throughout entire length, interrupted only at anterior margin of epistoma. Frontal sutures barely perceptible or wholly imperceptible. Hypostoma insignificantly convex, transversely striate, reddish-rust, gular band much darker, enlarged anteriorly; lateral to gular band three–four setigerous pores in transverse row in anterior half of hypostoma. Temporo-parietal lobes in



109 Fig. 52. Larva of *Monochamus saltuarius* Gebl.

a—head and pronotum; b—abdominal tergite with dorsal locomotory ampulla.

anterior half and basally rusty, at anterior margin with dark brown fringe, with piliform solitary bristles, in posterior half dorsally whitish, without bristles. Antennae short, conical, brownish, segments basally with whitish ringlet. Eyes hyaline, convex, below and slightly behind antennae. Clypeus large, trapezoid, whitish, basally somewhat rusty, laterally with short, barely perceptible isolated bristles. Labrum somewhat rusty, highly tapering toward base, at anterior margin broadly rounded, in anterior half with long rusty bristles, in posterior half glabrous, medially with pair of long wide-set bristles. Mandibles black, elongate, gently sloping apically.

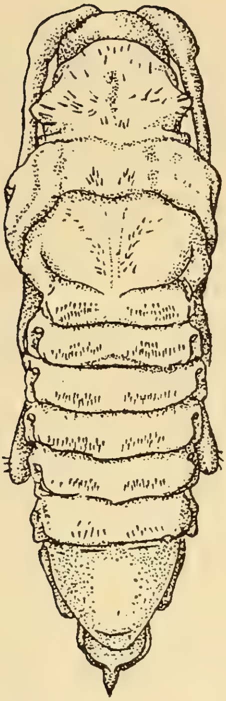
Pronotum twice wider than long, at anterior margin with rusty hairs 109 forming laterally three–four, medially one interlacing transverse row, posteriorly with somewhat rusty glabrous square divided by median longitudinal white band, on disk of this square with pair of wide-set bristles.

Pronotal shield somewhat rusty, compactly sclerotized, with minute dense spinules, with uneven (minute and much larger) white punctures forming clusters laterally in anterior half and interlacing transverse row basally, disk with solitary random bristles, at anterior angles with gently sloping shallow notch, laterally demarcated by short longitudinal grooves, at anterior angles in region of notch with triangular depression. Mesonotum in anterior half sclerotized, in posterior half with rusty hairs forming transverse band interrupted medially. Metanotum with minute ampullaceous granules forming two transverse rows divided by transverse groove. Prothoracic presternum laterally in anterior half with long rusty hairs, in posterior half with lustrous glabrous square. Eusternum coriaceous, in posterior half and apically glabrous, disk with long hairs forming transverse band. Meso- and metasterna with deep medial transverse groove, before which laterally and medially with rusty hairs forming transverse band.

Abdomen elongate, laterally with numerous rusty hairs. Spiracles of abdominal segments half size of mesothoracic spiracles. Dorsal locomotory ampullae convex, with lustrous ampullaceous granules forming four transverse rows and one lateral row. Between transverse rows and lateral
110 row lies cluster of generally six granules. Ventral locomotory ampullae divided by transverse groove, behind which ampullaceous granules form one, but in front one to three rows. Abdominal tergites VIII–IX on disk glabrous, laterally and at posterior margin with sparse hairs. Anal segment with dense rusty hairs. First instar larvae on outer side of mandibles with one, at anterior margin of epistoma with two, at anterior margin of hypostoma with four, and laterally on abdominal segments I–VIII with one spinule. These spinules disappear after molt. Body length of late instar larvae 20–28 mm, width of head 3.5–4.0 mm.

Pupa (Fig. 53): Characterized by large number of spinules in frontal region and long large sclerotized spinule at apex of urogomphus. Head medially with deep longitudinal trough, lateral to it in front of antennae with numerous long setiform spinules forming broad longitudinal field, at anterior margin near base of clypeus with six spinules forming transverse row interrupted medially, occiput glabrous, lustrous. Labrum elongate, apically broadly rounded, in anterior half along margins with long acicular spinules. Upper ocular lobe with two bristles. Antennae in second half bent ventrad, here spiraled, forming two incomplete (female) or two complete loops (male).

Pronotum transverse, uniformly sloping anteriorly, basally with narrow transverse groove, laterally with large obtusely produced tubercle, with numerous setiform spinules randomly distributed over entire surface or forming not fully distinct clusters on hind clivus and lateral tubercles. Mesonotum convex, posteriorly slightly produced, here broadly rounded,



109 Fig. 53. Pupa of *Monochamus saltuarius* Gebl.

with short acicular spinules forming two diverging bands extending from base of shield toward base of elytra but not up to them. Metanotum lustrous, insignificantly convex, medially with longitudinal groove, at posterior margin directly truncate, not rounded, with acute dense spinules forming two bands diverging from middle of posterior margin toward alar base. Femora on outer side with five–six acicular apical spinules forming distinct transverse row.

Abdomen moderately elongate, gradually tapering toward tip. Abdominal tergites in posterior half convex, in anterior half transversely depressed, medially with longitudinal groove, lateral to it in posterior half with rusty acicular spinules directed backward and forming dense transverse band divided by median longitudinal groove. Two–three rows of spinules observed in each transverse band. Tergite VII convex, lustrous, triangular, apically gently rounded, in posterior third with solitary minute, sometimes barely perceptible, setiform spinules. Tergite VIII semicircular, convex, lustrous, without spinules. Urogomphus at tip of abdomen highly extended, terminating in long large, slightly anteriorly curved, sclerotized spinule. Ridges bordering tip of abdomen laterally (ventral view) with two–five minute setigerous spinules on ventral side. Valvifers of female spherical, basally slightly wide-set, apically with small tubercle, bent toward each other. Body length 14–20 mm, width of abdomen 4.5–4.8 mm.

Material: Collected in western and eastern Siberia. Adults 321, larvae 108, pupae 2 males and 2 females, larval exuviae with beetles and pupae from cells 5.

Distribution: From Finland through the entire taiga zone of the USSR, northern Mongolia, northern China, Korea up to Pacific Ocean coasts includ-
111 ing Sakhalin, Japan (Honshu, Shikoku). Common in Altai, Tuva and eastern Siberia.

Biology: Inhabits coniferous forests; found in large numbers in southern regions of Siberia and Primor'e. Ecologically associated mainly with spruce and fir plantations. Beetles appear in large numbers in June and July. This is partly confirmed by the fact that of the 251 specimens collected during the season, 1.2% were caught at the end of May, 28.7% in June, 60.9% in July, 8.0% in August, and 1.2% in September. The beetles initially remain in the crown of large trees, feed on the bark of young shoots, and nibble squares in them up to the wood. Mating takes place in the crown or more often on the stems of trees.

Females lay eggs under the bark through elongate, infundibular cavities. Ovipositing commences mid-June and continues up to September. Maximum eggs laid in July. Insects infest knots, upper part of stems of drying, windfelled or freshly cut trees. The larvae hatch about 2.5–3.0 weeks after oviposition. For example, in nature, from eggs laid on July 12th, larvae began to hatch on the 28th day of this month. In the laboratory, larvae hatched on March 15th–17th from eggs laid on February 23rd.

Hatching of larvae takes place in July and August, partially early September. The larva lives a long time under bark, destroys bast fiber, makes longitudinal sinuous galleries, gently impressed on sapwood, and throws out the frass; hence the galleries under the bark look like extensive hollow ducts, only at places filled with loose coarse frass. Length of gallery under bark up to 23 cm, width initially 2–3 cm, increasing up to 7–8 cm. Before the second hibernation, larvae bore into the wood almost at a right angle and there, in the upper layer at a depth of 12–17 mm, make a longitudinal or spatulate gallery terminating in a pupal cell, which is separated from the hollow gallery by a plug of frass. Length of hollow gallery 5 cm, plug 4.5 cm; length of pupal cell 4.5 cm, width 1.3 cm; width of entry hole up to 8.0 mm.

Pupation of larvae is completed after the second hibernation. The first pupae appear in May and the last in early July. Maximum pupae observed June-end. Pupal stage lasts not less than two weeks. For example, in Salair, from pupae formed by June 23rd, beetles began to emerge from July 7th.

Young beetles appear in wood from May-end to July. Developed beetles nibble round flight openings (up to 4.0 mm diameter) on the bark surface and exit from the cell. Emergence of beetles from wood begins in the last days of May and continues almost up to July-end. Maximum beetles exit from wood in the first half of July. Generation—two-year cycle. Based on 31 individuals, larvae before pupation weigh 106–297 mg (181.2 ± 9.8), pupae 95–265 mg (160.4 ± 8.4), young beetles 68.5–221 mg (134.5 ± 7.5).

Monochamus saltuarius Gebl. is more adapted to the montane forest belt. It appears in significantly large numbers in forests destroyed by felling and wind damaged. From larvae collected in the forest, we raised 58 beetles —31 on spruce, 24 fir, 2 cedar, and 1 on larch. In addition, during forest inspections, we collected (from wood) 152 larvae, pupae, and beetles—70 from spruce, 47 fir, 33 cedar, and 1 each from pine and larch. This species coexists with *Monochamus urussovi* (Fisch.) on fir and *M. sutor* (L.) on spruce and cedar.

112 6. **Monochamus impluviatus** Motsch.

Motschulsky, 1859. *Bull. Cl. Phys.-Math. Acad. Sci. St. Petersb.*, 17: 571; Gressit, 1951. *Longic. Beetles of China*, 2: 394; Plavil'shchikov, 1958. *Fauna SSSR*, 23, pt. 1: 526-528; Cherepanov and Cherepanova, 1973. *Nov. i maloizv. vidy fauny Sibiri*, 7: 63–65.

Adult (Fig. 54): Distinguished from other species of the genus by short thick body, sharp granular punctation at base of elytra, and minute grayish pilose specks on elytra. Head on occiput broadly rounded, with bold punctation, sinciput depressed, here with round yellow spot, frons barely convex, with minute evanescent punctation and gray adherent, not very dense hairs, medially with narrow longitudinal groove, near base of antennae with more (male) or less (female) produced tubercle. Eyes broadly emarginate, sharply faceted. Antennae thick, short, in females extending or even not extending up to apex of elytra, in males extending beyond by 8th segment; segments basally with gray pilose ringlets (female) or without them (male).

Pronotum transverse, laterally with conical spiniformly extended tubercle, apically and basally with broad flange, disk convex, with bold uneven, sometimes transversely rugose punctation and somewhat rusty or grayish, randomly distributed adherent hairs forming behind anterior flange four small round spotlets—two on disk and one on each side at base of lateral tubercles. Pronotal shield short, triangular, posteriorly narrowly rounded, with yellowish or gray hairs, medially with glabrous longitudinal band; sometimes with sparse hairs not forming continuous pubescence.

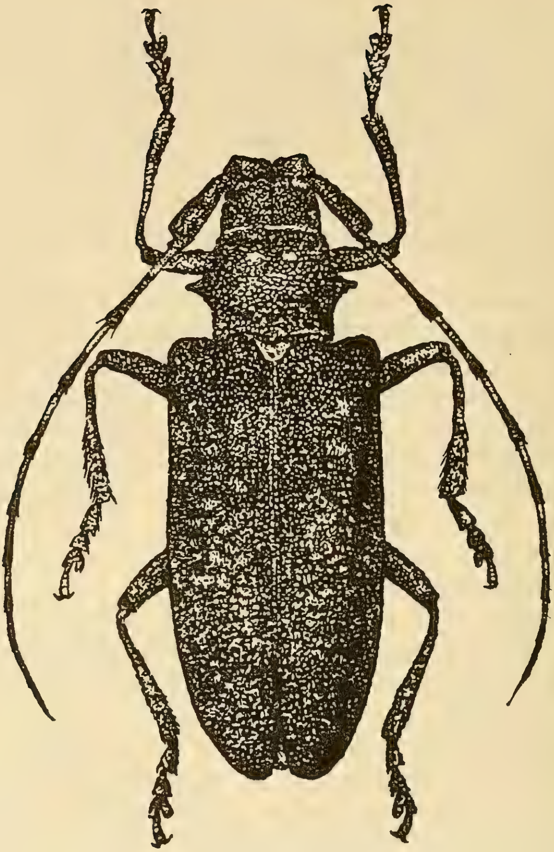


Fig. 54. *Monochamus impluviatus* Motsch.

Elytra parallel-sided (male) or beyond base slightly enlarged (female), in posterior fourth roundly tapering, apically with narrowly or gently rounded inner angle, disk uniformly convex, with slightly projecting or straight humeral tubercles, in anterior fourth with bold dense, distinctly granular, in remaining part with barely perceptible, vanishing simple punctation, with somewhat rusty and patchy gray adherent hairs imparting fine speckled appearance. Forelegs in males almost not longer than remaining legs. Midtibiae on outer side with shallow distal notch bearing brush of short golden-brown bristles. Body ventrally with compact adherent gray hairs. Sternite V apically broadly emarginate, laterally at posterior margin with 113 long black, very dense hairs (female) or broadly rounded, without long black hairs (male). Body, legs, and elytra black. Antennae of females variegated (segments basally with gray pilose ringlets), in males entirely black. Body length 11–18 mm.

Egg: White, elongate, slightly curved, rounded at poles. Chorion dull silver, with fine cellular sculpture. Length 3.1, width 1.0 mm.

Larva (Fig. 55): Distinguished from larvae of other species of the genus *Monochamus* by location of hairs at anterior margin of pronotum, presence of depression on epistoma, gentle notch at anterior angles of pronotal shield, and other characters. Head barely tapering anteriorly, almost parallel-sided, half retracted into prothorax. Epistoma in anterior half rusty, in posterior half bright with yellowish tinge, at borders of anterior and medial third with long bristles in transverse row, beyond them lateral to longitudinal suture with broad depression, at anterior margin with two lateral bristles. Frontal sutures barely perceptible. Medial (longitudinal) suture sharp, only at anterior margin interrupted. Hypostoma reddish-rust, at anterior angles narrowly rounded, in anterior half with barely perceptible

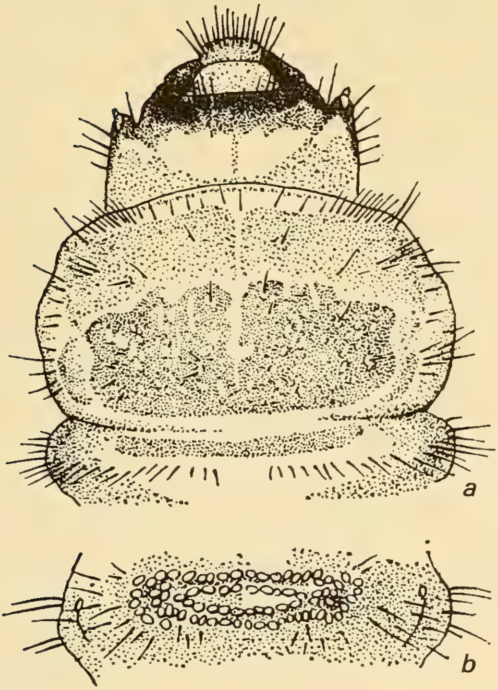


Fig. 55. Larva of *Monochamus impluviatus* Motsch.

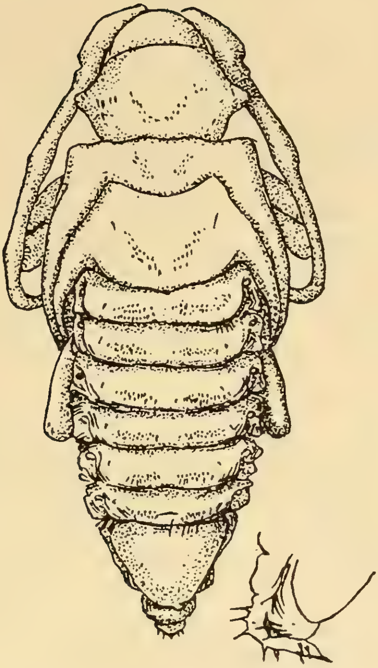
a—head and pronotum; b—abdominal tergite with dorsal locomotory ampulla.

bristles in transverse row. Temporo-parietal lobes reddish-rust, at anterior margin dark brown, posteriorly bright, in anterior half with sparse solitary (dispersed) piliform bristles in transverse row. Antennae short, brownish or somewhat rusty. Clypeus short, length one-fourth maximum width, basally somewhat rusty, in anterior half whitish, laterally with barely perceptible short bristle. Labrum apically broadly rounded, somewhat rusty, in anterior half slightly convex, with short rusty bristles, basally glabrous. Mandibles black, apically obliquely truncate, with angularly produced ventral denticle, 114 basally on outer side with very short longitudinal indentations appearing as small incisions.

Pronotum twice wider than long, more tapering anteriorly, at anterior margin with broad dull white fringe, behind it with setiform hairs forming lateral transverse band passing mediad into rarefied transverse row; beyond this row and laterally with glabrous yellow square divided by median longitudinal white band, lateral to this band with one large bristle on each side. Pronotal shield yellow, compactly sclerotized, basally with white minute punctures generally forming one interlacing or sufficiently entire transverse row, medially in anterior half with white longitudinal groove, lateral to it sometimes with large fusing white punctures forming longitudinal ellipse, at anterior angles with gently sloping notch, laterally demarcated by short longitudinal grooves uniting anteriorly with transverse triangular indentation. Laterally and in front of this indentation lie a few somewhat rusty setiform hairs. Prothoracic presternum with long sparse hairs, laterally with extensive yellow glabrous lustrous square. Eusternum convex, apically with numerous hairs, in posterior half glabrous. Basal part of prosternum (basisternum) at anterior margin sclerotized, laterally with rusty hairs forming small cluster. Meso- and metasterna medially with minute lustrous granules forming two transverse rows divided by groove.

Abdomen moderately elongate, laterally with somewhat sparse rusty hairs. Dorsal locomotory ampullae convex, with white granules forming four transverse rows and one curved row on each side. Between curved lateral and transverse rows lies a cluster of five granules. Ventral locomotory ampullae divided by transverse row, behind which lie one–two, posteriorly one transverse row of granules. Sternite IX glabrous, at posterior margin with long hairs forming transverse row. Tergite IX short, transversely oval, laterally and at posterior margin with long or short sparse hairs. Body length 20–23 mm, width of head up to 3.2 mm.

Pupa (Fig. 56): Readily recognized by location of spinules in frontal region, short antennae curved annularly, and by other features. Head broad, comparatively short, with median longitudinal groove; lateral to this groove in front of antennae with numerous acicular spinules forming longitudinal band curved laterally. Sometimes left and right bands almost converge,



113 Fig. 56. Pupa of *Monochamus impluviatus* Motsch.

with their ends forming characteristic ring of spinules. Occiput glabrous, lustrous, broadly rounded. Upper ocular lobes with one–three short spinules. Labrum elongate, apically gently rounded, here with spiniform bristles in transverse band. Anterior margin of frons with six bristles in transverse row.

Pronotum distinctly transverse, convex, laterally with large obtuse or at end slightly acute, conically extended tubercle, with dispersed acicular bristles forming small, indistinct solitary clusters or two rows diverging anteriorly on hind clivus. Mesonotum slightly convex, with slightly angularly produced shield, with acicular spinules forming two bands extending from apex of shield to base of elytra. Metanotum broad, moderately convex, medially with narrow longitudinal groove, posteriorly not rounded, almost directly truncate, with minute thin spinules forming two narrow bands
115 diverging anteriorly. Femora on outer side with minute acute apical spinules in transverse row.

Abdomen in region of segments III–IV more (female) or less (male) enlarged, gradually tapering from here toward apex, dorsally with longitudinal groove. Abdominal tergites in posterior half convex, here lateral to longitudinal groove with numerous acute spinules forming narrow transverse band consisting of two–three rows. Tergite VII almost oblong, triangular, convex, posteriorly narrowly rounded, in posterior half with minute, barely perceptible, dispersed spinules. Tergite VIII transverse, convex, lustrous, with barely perceptible, bright solitary bristles. Tip of abdomen with conically produced urogomphus terminating in long acute sclerotized spinule. Ridges bordering tip of abdomen laterally (ventral view) with solitary coriaceous, produced setigerous spinules sclerotized only at tip. Valvifers of female slightly elongate, insignificantly wide-set. Body length 15–20 mm, width of abdomen 4.5–6.0 mm.

Material: Collected in Altai, Tuva, and eastern Siberia. Adults 46, larvae 49, pupae 2 males and 3 females, larval exuviae with beetles from cells 5.

Distribution: From the Urals to the Pacific Ocean coasts including Sakhalin. Known also in northern Mongolia, northeast China, and North Korea. Penetrates northward in Siberia up to Zhigansk.

Biology: Infests coniferous forests, ecologically associated with larch. Sporadically found, comparatively rarely. Flight of beetles in June and July. In the forest, 36 beetles were caught—6 in June, 22 in July, and 8 in August. Beetles initially remain in the crown of larch trees, feed on the bark of young shoots, and nibble coniferous needles or cones. Then, after maturation of gonads, they mate and the females oviposit on drying and felled larch trees. The female makes a 3–4 mm wide cavity in the bark up to the bast fiber, then introduces its ovipositor in it, and lays an egg under the bark. Females infest log knots and apices of trees 3.5–5.3 cm in diameter. The egg stage lasts 18–20 days.

Larvae hatching from eggs appear in July and August. In the first summer, they live under bark and make broad, uneven, squarish galleries impressed gently on sapwood. After hibernation, they continue to make galleries under bark, then in June–July bore into wood, and there make spatulate galleries up to 15 cm long and 0.5–2.0 cm wide. They remain in wood for a second hibernation. The following summer, in May–June, they make a cell at the end of the gallery, transverse or slightly oblique to the surface. A layer of wood up to 3 mm thick remains between the anterior end of the cell and the bark. The gallery behind the cell is compactly plugged up to the end with fibrous frass. The entry hole into the wood is oval, longitudinal to the stem, and from 5 mm × 2 mm to 9 mm × 4 mm. Length of pupal cell 21–28 mm, width 6–8 mm. Larvae pupate in cells with their head toward the bark.

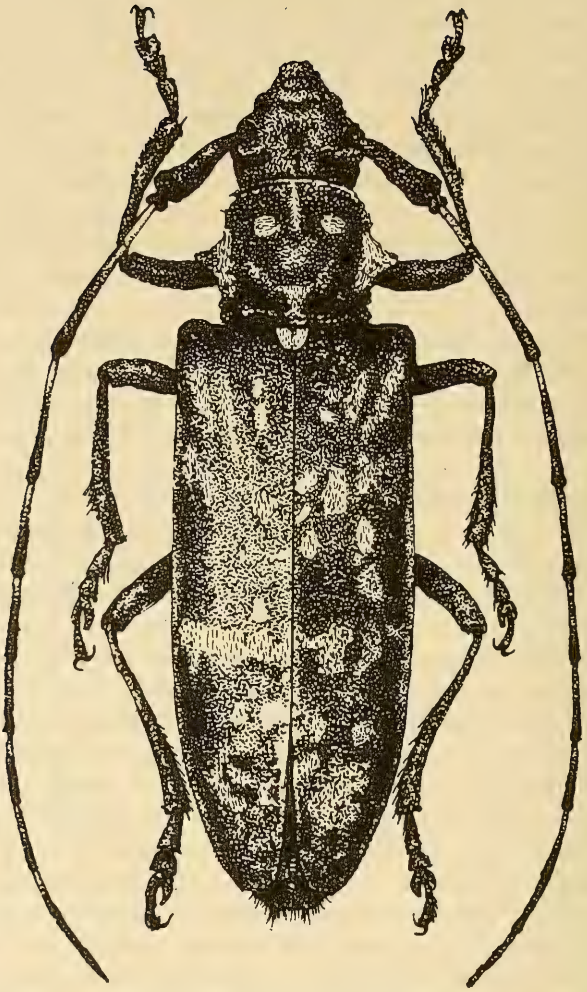
Pupation begins by May-end or early June and is completed during the first ten days of July. We found the first beetles in Altai June 4th. Pupae develop in two–three weeks. Under laboratory conditions at room temperature (about 20°C), a larva pupated on March 15th and the beetle emerged from it on April 2nd. In the forest, young beetles appear in cells by mid-June and are found in them until the first ten days of July. Developed beetles nibble round openings (5–6 mm diameter) on the shoot surface. The flight opening is generally made near the entry hole with the distance between them 1.5–2.0 cm. Emergence of beetles begins in the second half of June and concludes in July. Generation—two–year cycle. Based 116 on 15 individuals, larvae before pupation weigh 140–301 mg (207.1 ± 12.7), pupae 126–274 mg (180.1 ± 9.9), young beetles soon after emergence from wood 125–246 mg (148.7 ± 9.3).

Monochamus impluviatus Motsch. is a comparatively rare species, found on the log knots of windfelled trees and on stubs in the felling areas. We found it only on larch. Sometimes *Acanthocinus carinulatus* Gebl., *Rhagium inquisitor* (L.), and some other species coinfest trees with it.

7. **Monochamus nitens** (Bat.)

Bates, 1884. *Journ. Linn. Soc. Lond.*, 18: 238 (*Monochammus*); Kojima and Okabe, 1960. *Food Plants of Japan, Cerambycidae*, 37, 153; Kojima and Hayashi, 1969. *Insects' Life in Japan*, 1: 126; Krivolutskaya, 1973. *Entomofauna Kuril'skikh ostrovov*, 107.

Adult (Fig. 57): Characterized by convex lustrous elytra, yellow spotlet on sinciput, and other distinguishing characters. Head with compact uneven (on occiput, antennal tubercles, and along frontal lobes with bold, in middle of frons with very minute) punctation and adherent gray or yellowish hairs, with narrow median longitudinal groove and produced antennal tubercles. Eyes sharply faceted, deeply incised. Antennae 2.0 (male) or 1.2 (female) times longer than body, extending beyond apex of elytra by 6th (male) or 10th (female) segment, with dense granular (male) or minute simple (female) punctation. Pronotum not longer (male) or shorter (female) than basal width, in anterior third with broad, at posterior margin with narrow flange, laterally with large, conically extended tubercle, convex, with bold uneven punctation, on flanges with transverse striae, with somewhat rusty or grayish hairs forming one large spot on each flange. At base of lateral tubercles two transversely set spotlets occur on anterior flange. Pronotal shield posteriorly broadly rounded, with dense adherent rusty or gray hairs, medially with glabrous longitudinal band. Elytra parallel-sided, in anterior third with distinct or faint semicircular depression leaning 117 toward inner side of humeri by its ends, beyond humeri slightly compressed, apically individually (female) or jointly (male) rounded, basally with coarse, in remaining part with barely perceptible, evanescent punctation, highly lustrous surface, with sparse semiadherent rusty-brown and



116 Fig. 57. *Monochamus nitens* (Bat.).

dense compact adherent yellow or white hairs forming spots of different sizes, imparting a mottled appearance. Forelegs in males slightly longer than midlegs, midtibiae on outer side with barely perceptible distal notch bearing short brownish bristles forming brush. Abdominal sternite V in female with gentle apical notch, laterally bearing long dense black hairs forming two characteristic clusters at end. Sternite V in male apically obtuse, with short rusty hairs. Body, antennae, and legs black, sinciput with somewhat rusty spotlet. Elytra black, lustrous. Body length 23–29 mm.

Material: Description compiled on the basis of collections made in Japan. G.O. Krivolutskaya found a beetle on Kunashir Island.

Distribution: Kunashir. Japan (Hokkaido, Honshu, Shikoku, Kyushu). There are reports of its presence on Sakhalin.

Biology: Ecologically associated with coniferous plantations. Flight of beetles in July and August. According to reports of Kojima and Okabe (1960), it infests trees of *Abies mariesii*, *Abies firma*, *Larix leptolepis*, and other woody plant species.

8. **Monochamus guttatus** Bless.

Blessig, 1873. *Horae Soc. Ent. Ross.*, 9: 196; — *guttulatus* Gressit, 1951. *Longic. Beetles of China*, 2: 394; Plavil'shchikov, 1958. *Fauna SSSR*, 23, pt. 1: 528–529; Cherepanov and Cherepanova, 1973. *Nov. i maloizv. vidy fauny Sibiri*, 7: 67–70.

Adult (Fig. 58): Distinguished from other species of the genus by white, densely pilose spotlet on each elytron. Head with very compact (on frons much finer) punctation, with narrow median longitudinal groove and dense adherent yellowish-gray hairs. Antennae thin, 2.0 (female) or 2.5 times (male) longer than body, extending beyond apex of elytra by 5th (male) or 6th (female) segment. First antennal segment thick, with coarse compact punctation; remaining segments thin, with very minute simple (male and female) punctation, with tender, not very dense, adherent hairs, with broad sharp or faint white pilose ringlets; 11th segment with distinct appendage. Eyes sharply faceted, deeply emarginate, with very narrow interlobular interception.

Pronotum apically and basally with gentle flange, not longer or even shorter than basal width, convex, with compact punctation (spaces between punctures narrow, shagreen), medially sometimes with small longitudinal smooth band, with dense yellowish-gray hairs, laterally with small spiniform tubercle. Pronotal shield posteriorly broadly (sometimes angularly) rounded, entirely with dense adherent grayish-yellow hairs, medially without glabrous band.

Elytra parallel-sided (male) or behind base distinctly enlarged, in posterior fourth roundly tapering, apically individually rounded, disk convex, with compact, deep, basally much bolder, on hind clivus minute punctation, with adherent yellowish-gray hairs, beyond middle with densely pilose, contrastingly projecting, white round or slightly transversely elongate spotlet. Forelegs not longer than midlegs, foretibiae not longer than midtibiae. Abdominal sternite V apically broadly rounded, with short hairs (male),
118 or slightly emarginate, at posterior angles with long hairs (female). Body and elytra black, with brownish tone. Antennae brownish-rust, apices of 4th–10th segments generally much darker. Legs dark brown, with somewhat rusty tinge. Body length 9–15 mm.

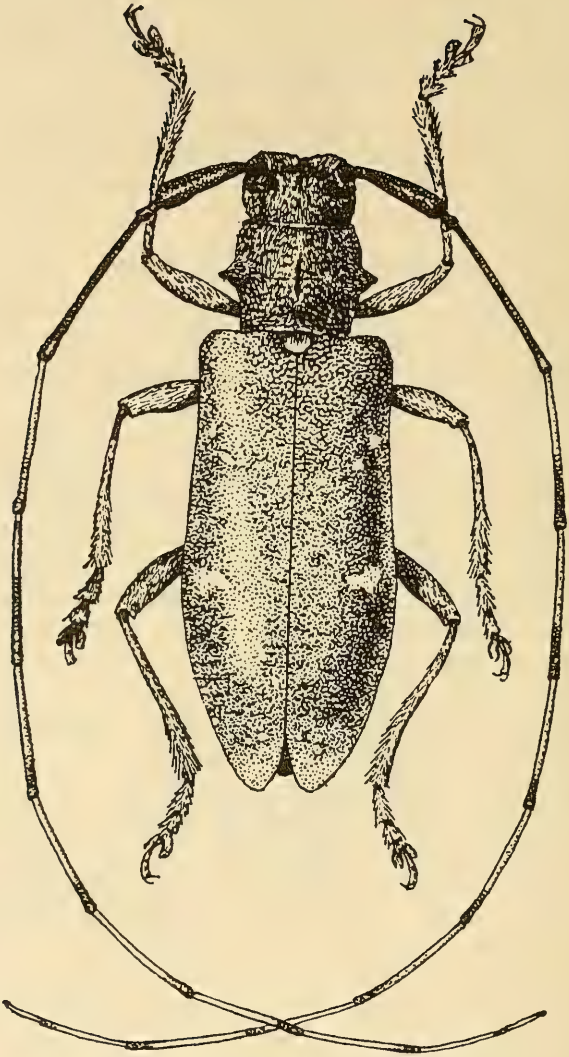
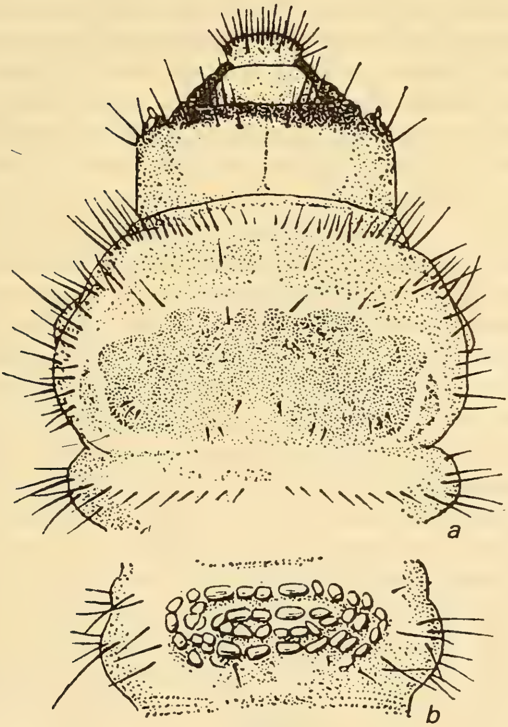


Fig. 58. *Monochamus guttatus* Bless.

Egg: White, elongate, uniformly tapering toward poles, here gently rounded. Chorion soft, semitransparent. Length 2.3 mm, width 0.6 mm.

Larva (Fig. 59): Characterized by small body, distinct ocelli at bases of antennae, and other features. Body slender, elongate. Head parallel-sided, less than half retracted into prothorax. Epistoma at anterior margin (near posterior angles of clypeus) with three or two long lateral bristles forming transverse row, with somewhat rusty-brown fringe (much darker near base of mandibles) bearing at its posterior margin four long bristles in transverse row, laterally fusing with temporo-parietal lobes (frontal sutures not perceptible), medially with sharp longitudinal suture. Hypostoma barely convex, with narrowly rounded anterior angles, somewhat rusty, at anterior margin with rusty or rusty-brown fringe. Gular band dark rust, before middle with pair of sometimes distinct translucent pores in transverse row. Temporo-parietal lobes bright rust, at anterior margin with broad dark rust fringe, behind it with three large piliform bristles in transverse row. Antennae bright rust, conical, apically insignificantly projecting from antennal socket. Hyaline or pigmented ocelli close below bases of antennae. Clypeus large, trapezoid, highly tapering anteriorly, lustrous, without lateral bristles, whitish, basally with vague rusty hue. Labrum somewhat rusty, transversely oval, highly tapering toward base, at anterior margin



119 Fig. 59. Larva of *Monochamus guttatus* Bless.

a—head and pronotum; b—abdominal tergite with dorsal locomotory ampulla.

broadly rounded, in anterior half with long thin dense bristles. Mandibles 119 black, basally dark red or reddish-rust, moderately elongate, apically steeply sloping, with insignificantly projecting ventral denticle.

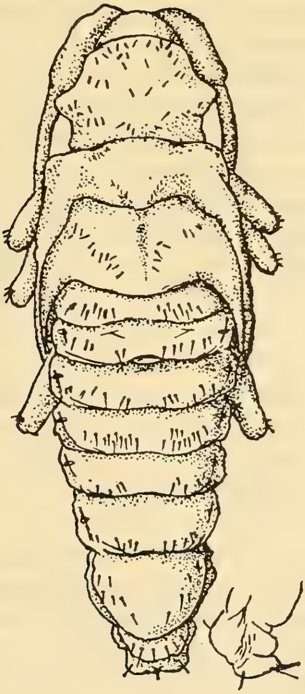
Pronotum gently tapering anteriorly but steeply toward base, in anterior third on posterior edge of white fringe with numerous rusty hairs forming transverse band bearing laterally up to three, medially up to one row of hairs. Pronotal shield convex, rusty-yellow, compactly sclerotized, with white translucent, large and minute punctures (sometimes forming transverse row near base and barely perceptible paramedial ellipse at anterior margin), with gentle, barely emarginate (as though incised) anterior angles. Lateral longitudinal grooves of shield short, uniting anteriorly with triangular transverse indentations edged in front and laterally by cluster of a few rusty hairs. Mesonotum in anterior half sclerotized, metanotum with two rows of ampullaceous granules. Prothoracic presternum convex, with sparse setiform hairs, laterally with glabrous rusty square. Eusternum well demarcated by groove, in anterior half with short rusty hairs, in posterior half glabrous, coriaceous. Basal part of prosternum (basisternum) in anterior half sclerotized, in posterior half coriaceous. Meso- and metasterna with two rows of ampullaceous granules separated by transverse groove.

Abdomen elongate, laterally with sparse bright hairs. Dorsal locomotory ampullae convex, with ampullaceous granules forming four transverse rows and one lateral row on each side bordering transverse rows laterally and posteriorly. Inner two transverse rows form transverse close ellipse. Ventral locomotory ampullae divided by transverse groove toward 120 which converge ampullaceous granules forming two transverse rows. Anal pore triradiate, ventral ray slightly shorter than or not shorter than lateral rays. First instar larvae on outer side of mandibles with one large spinule on each side, at anterior margin of epistoma with two, at anterior margin of hypostoma with four spinules. These spinules disappear after molt. Body length of late instar larvae 18–20 mm, width of head 2.0–2.2 mm.

Pupa (Fig. 60): Characterized by absence or presence of small number of spinules at apex of labrum, long acicular spinules on abdominal tergites, and other features. Body moderately elongate, small. Head slightly tapering before antennae, medially between antennae and on occiput with longitudinal groove, laterally on frons, near lower ocular lobes, with five–ten acicular spinules forming longitudinally extended cluster, at anterior margin with four–six acicular spinules in transverse row, occiput glabrous, lustrous, broadly rounded. Labrum elongate, at anterior margin broadly rounded, with acicular solitary or paired spinules or without them. Antennae long, thin, extending beyond midfemora, flexed ventrad, here spiraled with two (female) to three (male) loops.

Pronotum in basal width not more or barely more than its length, gradually sloping toward apex, here without flange, at posterior margin with narrow transverse groove, laterally with conical tubercle, disk uniformly convex, medially with narrow, sometimes barely perceptible, longitudinal groove, foreclivus with dispersed acicular spinules (sometimes forming separate dispersed clusters or transverse row at anterior margin), hind clivus with dense acicular spinules forming median transverse band bent angularly backward (in some insects, this band faint, in others sharp). Mesonotum moderately convex, at posterior margin with angularly extended, slightly raised shield, laterally with spinules forming small elongate cluster basally on shield. Metanotum at posterior margin broadly rounded, with deep median groove enlarging anteriorly, in posterior half with spinules forming paramedial cluster on each side. Sometimes near alar base two–three spinules occur. Femora on outer side with three–five long acicular apical spinules forming transverse row.

Abdomen gradually tapering from base toward tip. Abdominal tergites with common median longitudinal groove, lateral to it with long acicular spinules directed backward and forming transverse band tapering laterad. Sometimes these spinules (especially on tergites V–VI) not many and form



119 Fig. 60. Pupa of *Monochamus guttatus* Bless.

interlacing transverse row. Tergite VII convex, lustrous, apically narrowly rounded, in posterior half and laterally with long dispersed (sparse) acicular bristles. Tergite VIII convex, transverse, with paired bristles forming common transverse row. Urogomphus produced on dorsal side, short, apically with small sclerotized acute spinule. Tip of abdomen obtuse, laterally bound by high ridges (posterior view) bearing long thin bristles on slightly produced, sclerotized base. Valvifers of female elongate, tapering toward base, apically with small tubercle, bent toward each other. Body length 10–19 mm, width of abdomen 3.5–4.5 mm.

Material: Collected in the forests of Ussuri-Primor'e region. Adults 99 including 59 raised in the laboratory, larvae 58, pupae 3 males and 2 females, larval exuviae with beetles from cells 10.

121 *Distribution*: From Khabarov to Partizansk, Nakhodka, Vladivostok and Lake Khasan; Askol'de Island, northeast China, Korea. Common in the Primorsk belt from Partizansk to Khasan.

Biology: Inhabits zones of broad-leaved forests. Ecologically associated with many deciduous woody species. Flight of beetles begins during the last ten days of June and continues to August-end. During 1971–1972, 31 beetles were caught in nature—2 (6.45%) June-end, 8 (25.8%) first half of July and 11 (35.5%) second half, 8 (25.8%) first half of August and 2 (6.45%) second half. After emergence from wood, beetles feed on the bark of oak, European bird cherry, and other deciduous species, nibbling squares of different sizes (10–42 mm^2) on shoots. During this period, their gonads mature. The beetles then mate, after which the females commence oviposition. For this purpose, the female first nibbles a cavity (2–3 mm) extended transversely on the bark surface of the host tree, introduces its ovipositor into the cavity, and lays an egg under the bark. One egg is laid per cavity. Larvae hatch from the eggs after two–three weeks.

Young larvae live in or under bark, make longitudinal sinuous galleries, and fill them compactly with fibrous frass. Before the second hibernation, late instar larvae bore into wood and plug the entry hole with coarse fibrous frass. They make a longitudinal gallery up to 5.0 cm or more in length in the wood (in the upper layer). Entry hole oval, 3 mm × 5 mm. Larvae make pupal cell at end of gallery and pupate in it with their head toward the entry hole. A 1–2 mm layer of wood remains between the bark and pupal cell. Length of cell 16–20 mm, width 6–7 mm. Pupae are found from May-end to July and develop in about three weeks. For example, under laboratory conditions at a temperature of 21.2°C, a beetle emerged on April 12th from a pupa formed on March 24th; another beetle emerged on April 23rd from a pupa of April 5th.

Developed beetles nibble a round flight opening (up to 4.0 mm diameter) on the shoot surface and leave the cell. Emergence of beetles from

Table 13. Development of *Monochamus guttatus* Bless.

Year	April	May	June	July	August	September	October
1st	L	LP	LPA	PAE	AEL	EL	L
2nd	L	L	L	L	L	L	L
3rd	L	LP	LPA	PAE	AEL	EL	L

wood begins in the second half of June and is concluded in July. Generation—two-year cycle (Table 13).

Based on 23 individuals, larvae before pupation weigh 35.2–149.7 mg (96.1 ± 5.9), pupae 32.3–141.1 mg (88.2 ± 5.4), beetles before emergence from cell 27.3–120.8 mg (70.5 ± 4.4).

Monochamus guttatus Bless. is found sporadically (at places in large numbers) in Ussuri-Primor'e region in drying trees. It damages shoots of 2–8 cm diameter. From the larvae collected in nature, we raised 59 beetles—11 on oak, 24 manchu stripe maple, 3 European bird cherry, 4 Manchurian walnut, 2 hornbeam, 6 hazelnut, 1 alder, 5 elm, and 3 on willow. In addition, during forest inspections 69 specimens (larvae, pupae, beetles) were collected—8 from maple, 15 European bird cherry, 20 oak, 5 Manchurian walnut, 3 elm, 2 hazelnut, 3 birch, 2 hornbeam, 4 alder, and 3 from plum. Once on a shoot of manchu stripe walnut 37 cm long and 4.0 cm in diameter, we found seven larvae of *Monochamus guttatus* Bless., two pupae of *Eumecocera impustulata* Motsch., and a beetle of *Leiopus stillatus* Bat.

122 2. Genus *Acalolepta* Pasc.

Pascoe, 1858. *Trans. Entomol. Soc. Lond.*, 2, 4: 246;—*Dihammus* Thoms., 1864. *Syst. Cer.*, 80: 381; —*Haplohammus* Bates, 1884. *Journ. Linn. Soc. Lond., Zool.*, 18: 239 (type: *Monochamus luxuriosus* Bat.); —*Astynoscelis* Pic, 1905. *Mat. Lond.*, 5, 1: 8 (type: *A. longicornis* Pic); Aurivillius, 1922, In Junk: *Catal. Coleopt.*, 73: 440; Gressit, 1951. *Longic. Beetles of China*, 2: 496 (*Dihammus* Thoms.); Plavil'shchikov, 1958. *Fauna SSSR*, 23, pt. 1: 531 (*Dihammus* Thoms.); Kojima and Hayashi, 1969. *Insects' Life in Japan*, 1: 129.

Adult: Close to the genus *Monochamus* Guèr. Body large (*A. luxuriosa* (Bat.)) or comparatively small (*A. degenera* (Bat.)). Eyes broadly emarginate, their lower lobe elongate. Antennae in males 2.0–2.5 times longer than body, 3rd–10th segments apically with spinules forming more (*A. luxuriosa* (Bat.)) or less (*A. ussurica* (Plav.) and others) distinct crown. Pronotum near apex with broad flange, near base with transverse (sometimes double) groove or with narrow flange, laterally with acutely produced tubercle. Elytra basally with coarse granular punctation (*A. luxuriosa* (Bat.)) or without it, only with simple deep punctation distinct basally and vanishing in second half (*A. sejuncta* (Bat.), *A. cervina* (Hope), and others). Forelegs in males not long, tarsi moderately enlarged.

Larva: Characterized by large (*A. luxuriosa* (Bat.)) or small (*A. degenera* (Bat.)) body. Head parallel-sided. Frontal sutures generally perceptible. Ampullaceous eyes present at bases of antenna. Pronotal shield compactly sclerotized, spinules not distinguished in general sclerotization (*A. luxuriosa* (Bat.)) or less compactly sclerotized and spinules readily discernible; spaces between them equal to diameter of spinules (*A. ussurica* (Plav.), *A. sejuncta* (Bat.)).

Pupa: Head moderately bent. Labrum with dense (*A. luxuriosa* (Bat.)) or solitary (*A. ussurica* (Plav.), *A. sejuncta* (Bat.)) acicular bristles or glabrous (*A. degenera* (Bat.)). Antennae flexed laterad, in second half on ventral side spiraled with 3.0–3.5 (male) or 2.0 (female) loops. Abdominal tergites dorsally with numerous bristles forming one cluster on each side of longitudinal groove (*A. ussurica* (Plav.), *A. sejuncta* (Bat.)) or with large setigerous spinules (*A. luxuriosa* (Bat.)) or acicular bristles with solitary setigerous spinules (*A. degenera* (Bat.)).

Species of this genus are distributed mainly in southeast Asia and in Australia. In northern Asia, five species are known, of which three are found in Ussuri-Primor'e region and two on islands (Sakhalin, Kunashir). Up to six species are known in Japan. Species of *Acalolepta* Pasc. are ecologically associated mainly with broad-leaved forests. However, *A. sejuncta* (Bat.) infests deciduous trees as well as coniferous woody plant species, but *A. degenera* (Bat.) only herbaceous plants.

Type species: *Acalolepta pusio* Pascoe, 1858.

KEY TO SPECIES

Adults

1 (2). Elytra basally with granular punctation. Body length 22–37 mm. Japan, Kunashir Island, northeast China. . . . . **1. A. luxuriosa** (Bat.)

2 (1). Elytra basally without punctation, otherwise with simple deep punctures. Body length up to 20 mm, rarely up to 26 mm.

3 (8). Elytra with uniform silky interlacing pubescence, without white spots.

123 4 (5). Punctation in posterior half of elytra evanescent (especially on hind clivus), almost not perceptible. Body length 14–26 mm.

Ussuri-Primor'e region, China, northeast India, Nepal, Burma, Korea, Japan. . . . . 2. **A. cervina** (Hope)

5 (4). Punctation in posterior half of elytra not bold, but well perceptible, not evanescent.

6 (7). Pronotum with sparse deep, unevenly located punctures not forming continuous cover. Body length 14–20 mm. Southern Sakhalin, Kunashir Island, Japan, Korea. . . . . . 3. **A. sejuncta** (Bat.)

7 (6). Pronotum with dense deep punctures forming continuous cover on disk. Body length 10–16 mm. Ussuri-Primor'e region . . . . 4. **A. ussurica** (Plav.)

8 (3). Elytra with matte, coarse, variegated pubescence forming uneven, indistinct white or whitish-gray spots. Body length 7.5–13 mm . . . . 5. **A. degenera** (Bat.)

Larvae

1 (6). Pronotum in anterior third with close-set hairs forming dense transverse band and dense transverse row. Distance between hairs one-half to one-third their length. Body length of late instar larvae more than 20 mm, width of head not less than 2.0 mm. On woody plant species.

2 (3). Shield of pronotum entirely sclerotized, spinules not distinguishable in general mass of sclerotization. Body length of late instar larvae 49–60 mm, width of head 5.5–6.2 mm. On dimorphant . . . . 1. **A. luxuriosa** (Bat.)

3 (2). Shield of pronotum not entirely sclerotized, with distinct minute spinules separated by small space.

4 (5). Eusternum apically and in posterior half glabrous, medially with hairs forming transverse band. Body length 27–30 mm, width of head up to 3.0 mm. On dimorphant, elm, and conifers (spruce). . . . . 3. **A. sejuncta** (Bat.)

5 (4). Eusternum apically with hairs, medially and in posterior half glabrous. Body length up to 25 mm, width of head 2.1 mm. On ash and maple. 4. **A. ussurica** (Plav.)

6 (1). Pronotum in anterior third with dispersed hairs forming barely perceptible transverse band. Distance between hairs not less than their length. Body length 15–18 mm, width of head up to 2.0 mm. On roots of herbaceous plants . . . . . 5. **A. degenera** (Bat.)

Pupae

1 (2). Labrum apically with dense bristles forming two clusters. Abdom-

inal tergites in posterior half with large setigerous spinules. Body length 24–38 mm. . . . . 1. **A. luxuriosa** (Bat.)

2 (1). Labrum apically with solitary bristles or without them. Abdominal tergites in posterior half with long acicular bristles, at most with individual small spinules. Body length up to 26 mm.

3 (6). Abdominal tergites only with acicular bristles, without spinules.

4 (5). Bristles on abdominal tergites thin, bright rusty. Body length 15–21 mm. . . . . 3. **A. sejuncta** (Bat.)

5 (4). Bristles on abdominal tergites thick, dark rust. Body length 11–17 mm. . . . . 4. **A. ussurica** (Plav.)

124 6 (3). Abdominal tergites with acicular bristles and (on segments V–VI) with solitary setigerous spinules. Body length 8–14 mm. . . . . .5. **A. degenera** (Bat.)

1. **Acalolepta luxuriosa** (Bat.)

Bates, 1873. *Ann. Mag. Nat. Hist.*, 4, 12: 309 (*Monochammus*); Gressit, 1951. *Longic. Beetles of China*, 2: 401 (*Dihammus*); Plavil'shchikov, 1958. *Fauna SSSR*, 23, pt. 1: 532–533 (*Dihammus*); Kojima and Hayashi, 1969. *Insects' Life in Japan*, 1: 129–130.

Adult (Fig. 61): Distinguished from all species of the genus *Acalolepta* by large massive body, long rusty antennae in males and short dark brown variegated antennae in females with white ringlet at base of segments, and granular punctation at base of elytra. Head with compact adherent, more (male) or less (female) dense grayish-yellow pubescence, medially with deep longitudinal groove extending from anterior margin to base of occiput, in males on occiput, temples, and upper part of frons with large deep, sparse, unevenly located punctures, in females entire surface with very compact punctation. Frons convex, broad, laterally emarginate. Eyes large, elongate, sharply fine-faceted, broadly emarginate. Antennae in males long, almost twice longer than body, extending beyond apex of elytra by 6th segment, glabrous, without hairs. Third to 10th antennal segments apically with short spinules forming compact tuft; 1st segment thick, matte; 3rd segment notably longer than 4th. Antennae in females short, their 10th segment extending beyond apex of elytra, with minute compact adherent hairs; 3rd–10th segments apically without spinules; 3rd segment 1.5 times longer than 4th.

125 Pronotum transverse, basal width distinctly more than length, laterally with spiniform, acutely produced tubercle, apically and basally with broad flange, disk unevenly convex, medially in front of posterior flange with more (female) or less (male) distinct tubercle or without it (male), with compact fusing (female) or bold deep, not fusing (male) punctation, with more compact, uniform, generally gray (male) or uneven, spotty rusty

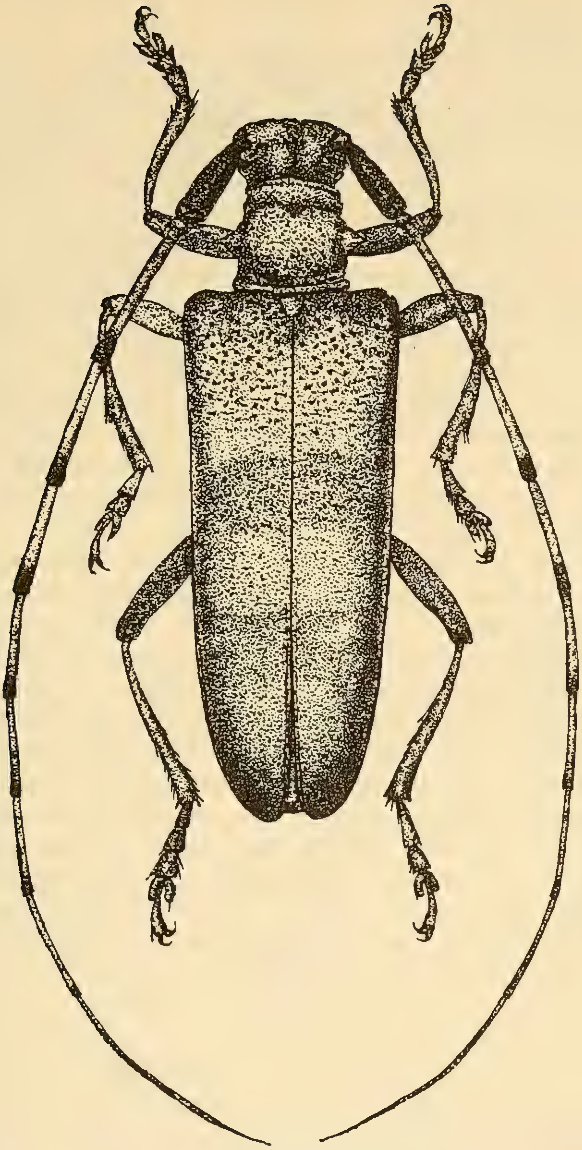


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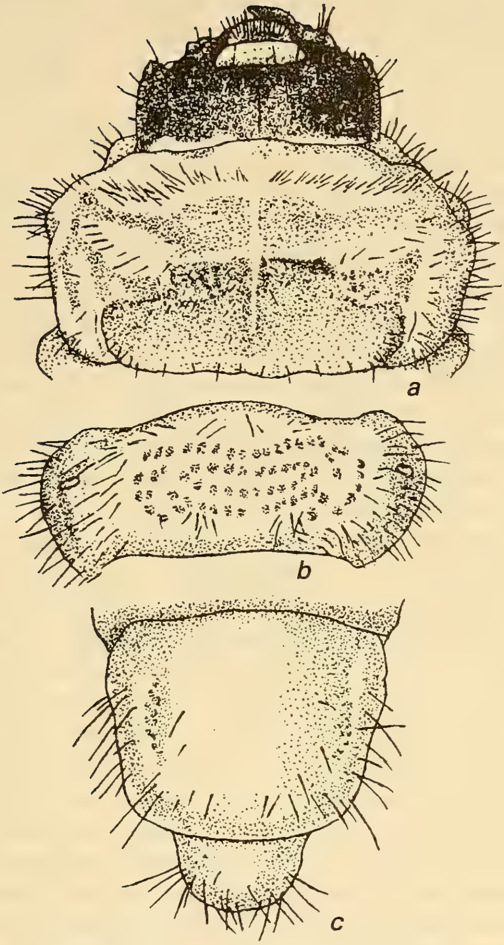
Fig. 61. *Acalolepta luxuriosa* (Bat.).

pubescence forming two rusty spots on disk (near anterior flange) and one broad, somewhat rusty spot basally on each lateral tubercle (female). Pronotal shield flat, posteriorly broadly rounded, medially with longitudinal troughlike groove, with grayish (male) or somewhat rusty, denser (female), compact adherent pubescence.

Elytra parallel-sided (female) or distinctly tapering toward apex (male), moderately convex, at apex with narrowly rounded, almost straight inner and slanting outer angle, basally with granular punctation passing laterally to humeral tubercle, in anterior half with bold deep (male) or minute (female) punctation, in posterior half with evanescent, barely perceptible punctation, with minute compact adherent, random gray hairs forming in middle or beyond middle broad indistinct transverse band. Femora with compact adherent pubescence, with numerous large (female) or sparse minute setigerous (male) punctures. Midtibiae on outer margin with deep distal notch bearing dense setaceous brush. Body ventrally with dense compact adherent pubescence and sparse translucent punctation. Sternite V of abdomen apically incised or slightly emarginate, in females at posterior angles with long dark brown bristles forming cluster on each side. Body black, antennae in males rusty, only 3rd–10th segments apically slightly blackish, in females black, with broad gray pilose basal ringlet. Body length 22–37 mm.

Larva (Fig. 62): Characterized by large size of body, compact sclerotization of pronotal shield, and hairs at apex of eusternum. Body large, elongate, white with yellowish hue. Head rusty or dark rust, at anterior margin much darker, parallel-sided, half retracted into prothorax. Epistoma in posterior half along suture slightly depressed, in anterior half with short and long piliform bristles, laterally demarcated by distinct frontal sutures, medially divided by longitudinal suture. Hypostoma insignificantly convex, transversely striate, laterally with straight sutures. Temporo-parietal lobes rusty, in posterior half dorsally whitish, at anterior margin with black fringe, behind it with individual setiform hairs, below antennae with small ampullaceous ocelli. Antennae white, short, barely projecting from antennal sockets. Clypeus large, trapezoid, somewhat rusty. Labrum barely convex, apically broadly rounded, in anterior half with long rusty bristles. Inner yellowish lobes of maxillae shorter than maxillary palp, apically roundly slanting from inner side, whitish, here with numerous short rusty bristles.

Pronotum sloping toward head, 2.0–2.5 times wider than long, in anterior third with rusty setiform hairs forming narrow transverse band, before shield smooth; in late instar larvae with translucent rusty round punctures and oblique (on sides) smooth rusty notch; in midinstar larvae without rusty punctures, with indistinct sculpture. Pronotal shield moderately convex, compactly sclerotized, without distinct spinules (in *A. sejuncta* (Bat.) spinules on pronotal shield readily perceptible), with deep punctation, medially with longitudinal groove, at anterior margin directly truncate, at anter-



126 Fig. 62. Larva of *Acalolepta luxuriosa* (Bat.).

a—head and pronotum; b—abdominal tergite with dorsal locomotory ampulla; c—tip of abdomen (dorsal view).

126 ior angles transversely gently emarginate, here with transverse triangular dark rust indentation uniting with lateral longitudinal groove extending backward up to base of shield. Sides of pronotum with sparse hairs, anterior margin of lateral triangular indentations with individual bristles in transverse row. Prothoracic presternum laterally with glabrous rusty spot, disk with short sparse hairs. Eusternum apically with sparse hairs, in posterior

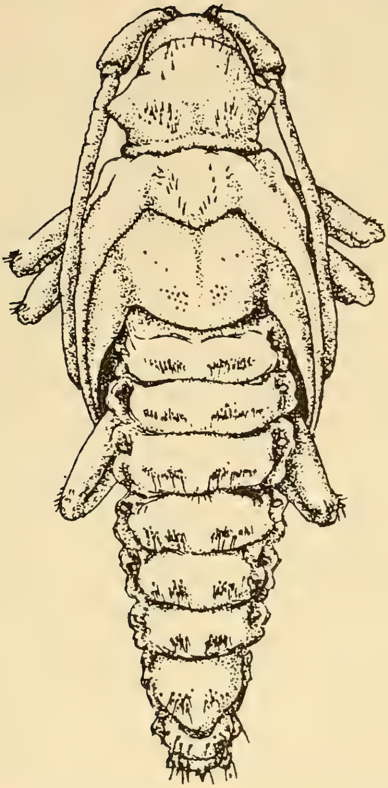
half glabrous, transversely striate. Base of prosternum (basisternum) glabrous, coriaceous, with transverse striae, only laterally with short hairs forming cluster on each side. Meso- and metasterna with barely perceptible granules forming two transverse rows divided by groove; before granules with short rusty hairs forming narrow band or interlacing transverse row.

Abdomen elongate, laterally with numerous long hairs, on segments I–VII with well-developed locomotory ampullae. Dorsal locomotory ampullae convex, with minute ampullaceous, weakly sclerotized granules forming two transverse parallel rows in anterior half, two backwardly curved rows in posterior half and two lateral longitudinal rows extending obliquely from anterior margin of locomotory ampullae backward and inward. Sternite VIII in posterior half with thick hairs in transverse row. Tergite IX 127 posteriorly broadly rounded, in posterior half and laterally with sparse hairs. Body length of late instar larvae 49–60 mm, width of head 5.5–6.2 mm.

Pupa (Fig. 63): Characterized by large body, dense cluster of bristles on labrum, and large acute setigerous spinules on abdominal tergites. Body white, large. Head slightly tapering anteriorly, between antennae with deep longitudinal troughlike groove, occiput rounded, sinciput flat, near upper ocular lobes with two–three thick acicular bristles, before antennae laterally with long thick bristles forming broad longitudinal outcurved band. Labrum with numerous (on sclerotized base) bristles forming two dense clusters. Antennae long, flexed laterad, in second half on ventral side of body spiraled with 2.0 (female) or 3.5 (male) loops.

Pronotum in basal width almost 1.5 times its length, laterally with large conical tubercle, tapering less toward base, more toward apex, in anterior third with broad flange, basally with transverse groove, disk convex, medially with longitudinal groove, before anterior flange with thin bristles on sclerotized base forming two narrow bands diverging from anterior margin at a right angle toward lateral tubercles, in posterior half with minute setigerous spinules forming extensive paramedial cluster extending obliquely laterad. Mesonotum convex, transversely striate, at posterior margin broadly rounded, with minute setigerous spinules forming on disk two longitudinal, slightly diverging bands. Metanotum slightly convex, medially with longitudinal groove, with transverse dotlike striae, with minute setigerous spinules forming two clusters diverging from medial line laterad and forward.

Abdomen thick, moderately elongate, gradually tapering from base toward tip. Abdominal tergites highly convex, with common median longitudinal groove, laterally with transverse, more (female) or less (male) distinct indentation, behind which with numerous large setigerous spinules directed backward and forming two clusters paramedially (much larger



126 Fig. 63. Pupa of *Acalolepta luxuriosa* (Bat.).

inner and smaller lateral) separated by small space. Abdominal tergite VII transverse, posteriorly broadly rounded, transversely striate, in posterior half with large setigerous spinules variously directed. Tergite VIII semicircular, posteriorly broadly rounded, laterally with solitary, barely perceptible spinules or without them. Tip of abdomen (ventral view) obtuse, laterally bound by high ridges fusing to form urogomphus terminating in sclerotized spinule. Valvifers of female large, hemispherical, contiguous. Body length 24–38 mm, width of abdomen 6.5–8.5 mm.

Material: Collected on Kunashir Island. Adults 10 (raised from larvae in the laboratory), larvae 30, pupae 6 males and 4 females, larval and pupal exuviae with beetles from cells 10.

Distribution: Kunashir Island, Japan (including Hokkaido), Korea, northeast China.

Biology: Inhabits broad-leaved forests. Ecologically associated with dimorphant (*Kalopanax septemlobum*) and *Aralia elata*. Flight of beetles July-end and in August. Beetles infest thick-stemmed trees of 30–40 cm diameter, sometimes raise their progeny on log knots (8–10 cm diameter) and on *Aralia elata* infest shoots 4–10 cm diameter. Larvae initially live 128 under bark, make galleries longitudinal to the shoot, and fill them with fine frass. Galleries are weakly impressed on sapwood. After the first or second hibernation, larvae bore into wood, leaving an entry hole (10–15 mm) on the surface longitudinal to the shoot. In wood, they penetrate up to 5–10 cm depth, on thin shoots up to the heartwood, and there make a longitudinal (7–10 cm long) gallery, then turn steeply toward the stem surface and make a pupal cell in the upper layer of wood transverse to the stem or slightly oblique to the surface, sometimes longitudinal to the stem. Cell separated behind from gallery by a plug of coarse fibrous frass. A layer of wood 1.0–3.5 mm thick remains between the cell and the bark. Length of cell 4–7 cm, width 1.5–2.5 cm. Length of plug separating cell from gallery 1.5–2.2 cm. Width of gallery in wood 1.2–2.0 cm, at places up to 3.5 cm. Galleries in wood are filled with fine frass. Larvae pupate in July, after the second or third hibernation. In 1974, the first pupae were found on July 2nd and the last pupae on the 25th of this month. Pupal stage lasts about three weeks. From a larva pupated on July 19th, the beetle emerged on August 8th. The atmospheric temperature during this period fluctuated from 9°C to 32°C (average 18.2 ± 0.5°C). Developed beetles nibble a round flight opening (12–13 mm diameter) on the stem surface and leave the cell through it. Emergence of beetles from wood begins in the second half of July and is concluded by August-end.

Based on 17 individuals in different stages of development, larvae before pupation weigh 580–2,980 mg (1,550 ± 177), pupae 498–2,650 mg (1,400 ± 150), beetles before emergence from cells 396–2,100 mg (1,100 ± 120). Six pupae had a total weight of 8,130 mg (100%), beetles emerging from them 6,090 mg (72.4%), i.e., the weight of the insects reduced by 27.6% during metamorphosis of the pupae.

Acalolepta luxuriosa (Bat.) infests physiologically weak and drying trees. It develops on the stem in the hypogeal zone as well as in the upper apical part. It is found more often on dimorphant (*Kalopanax septemlobum*) and rarely on *Aralia* sp. Ten larvae were found on a log cut from the stem of *Kalopanax* sp. (diameter 30 cm, length 1.0 m). The selfsame *Kalopanax* is infested repeatedly. We happened to find simultaneously the larvae of early (under bark), mid- and late (in wood) instars belonging to different generations.

2. **Acalolepta cervina** (Hope)

Hope, 1831. In Gray: *Zool. Misc.*, 27 (*Lamia*); Gressit, 1951. *Longic.*

Beetles of China, 2: 398 (*Dihammus*); Plavil'shchikov, 1958. *Fauna SSSR*, 23, pt. 1: 533–535 (*Dihammus*); Kojima and Hayashi, 1969. *Insects' Life in Japan*, 1: 125.

Adult (Fig. 64): In general features, close to *Acalolepta luxuriosa* (Bat.). However, well distinguished from it by the absence of granular punctation at base of elytra, presence of silky yellowish pubescence, and much brighter rusty color of body. Body elongate. Head with minute grayish, compact adherent pubescence, lateral to frons, near eyes, with individual bristles in longitudinal row, medially with deep narrow longitudinal groove extending from anterior margin of frons to occiput, in frontal region, on occiput and on temples with individual deep, not very large punctures. Antennae long, almost twice longer (male) or barely (female) longer than body, highly tapering toward apex, with very minute white adherent hairs, with short setae and dense fine punctation. First antennal segment thick, barely shorter than 4th; 3rd segment 1.5 times longer than 5th. Eyes boldly and
129 sharply faceted, gently emarginate, upper ocular lobes slightly broader than lacertus between them and lower lobes.

Pronotum in basal width not more than its length, laterally with conically extended, slightly raised tubercle, near apex with gentle flange, at base with two transverse grooves (of which posterior one sharper), disk convex, with silky compact adherent pubescence, with deep random punctures. Pronotal shield broad, tapering posteriorly, apically broadly rounded, with dense yellowish adherent pubescence.

Elytra elongate, gradually tapering from humeri toward apex, disk markedly convex, with straight humeri, apically individually broadly rounded, basally with bold deep, gradually reducing posteriorly and finally vanishing punctation (in posterior third punctation not perceptible, as though erased), with silky interlacing pubescence. Legs moderately long, tarsi barely enlarged. Midtibiae on outer margin with sharp distal notch bearing dense brush of short gray bristles. Hind tibiae on outer margin without distal notch, but with brownish-rust bristles forming brush. Body ventrally with compact adherent silky pubescence. Body brownish, with somewhat rusty hue or chestnut colored. Antennae rusty, apically slightly darkened. Body length 14–26 mm.

Material: A small series of adult insects was examined in the collection of the Zoological Museum, Moscow State University in Moscow and the Zoological Institute, Academy of Sciences, USSR in Leningrad.

Distribution: Ussuri-Primor'e region, Korea, China, India, Nepal, Burma, Japan.

Biology: Flight of beetles June-end and in July. Ecologically associated with deciduous woody plant species (Plavil'shchikov, 1958). We could not find it. Obviously, very rare.

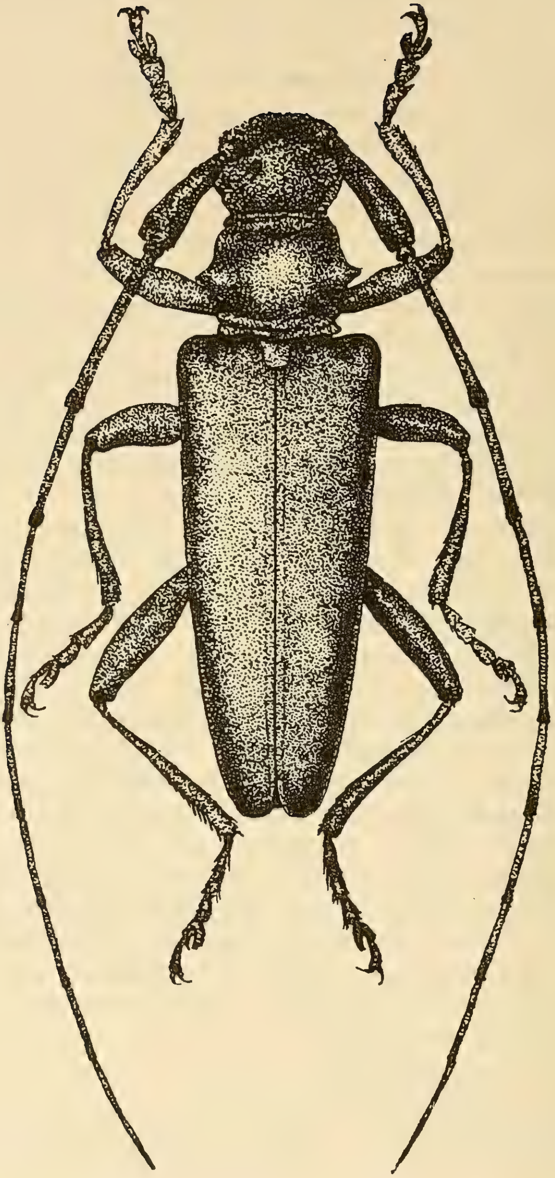


Fig. 64. *Acalolepta cervina* (Hope).

130 3. **Acalolepta sejuncta** (Bat.)

Bates, 1873. *Ann. Mag. Nat. Hist.*, 4, 12: 310 (*Monochammus*); Gressit,

1951. *Longic. Beetles of China*, 2: 398 (*Dihammus*); Plavil'shchikov, 1958. *Fauna SSSR*, 23, pt. 3: 535 (*Dihammus*); Kojima and Hayashi, 1969. *Insects' Life in Japan*, 1: 131–132; Krivolutskaya, 1973. *Entomofauna Kuril'skikh ostrovov*, 107 (*Dihammus fraudator* Bat.); Danilevskii and Kompantsev, 1975. *Nasekomye—razrusheteti drevesiny i ikh entomofagi*, 230 (*Dihammus fraudator* Bat.).

Adult (Fig. 65): Well distinguished from *A. luxuriosa* (Bat.) by absence of granular punctation and in this very feature resembles *A. cervina* (Hope), but in contrast to the latter with more distinct punctation on hind clivus of elytra. Body comparatively large. Head short, projecting, with dense compact adherent grayish-golden pubescence, medially from anterior margin of frons up to occiput inclusive with distinct speckled glabrous groove, with large random deep punctures. Eyes black, boldly and sharply faceted, broadly emarginate, elongate; length of lower ocular lobe distinctly more than its width. Antennae long, thin, 1.5 (female) or 2.5 (male) times longer than body, extending beyond apex of elytra by 7th (female) or 5th (male) segment.

Pronotum slightly shorter than wide, at margins (near apex and base) with broad flange, laterally with acute, conically extended tubercle, with compact adherent grayish-golden pubescence, disk convex, with deep random punctures. Pronotal shield flat, basally with barely perceptible trough, slightly tapering posteriorly and broadly rounded apically, with dense compact adherent hairs.

Elytra elongate, toward apex more (male) or less tapering or almost parallel-sided (female), with straight rounded humeri, inner to humeral tubercle with barely perceptible indentation, apically slightly obtuse, disk convex, with compact adherent yellowish or grayish-golden, at places sinuously located pubescence creating mixed coloration, from bright gray-golden to dark brown, basally with dense coarse, in second half with sparse, less coarse punctures. Femora uniformly thick, with dense compact adherent hairs. Hind femora not extending or barely extending up to hind clivus of elytra. Fore- and midtibiae with well-developed brush. Hind tarsi slightly shorter than tibiae; 1st tarsal segment shorter or almost equal to next two segments together. Body ventrally with dense compact adherent pubescence. Body and elytra dark brown with somewhat rusty tinge; antennae somewhat rusty, 1st segment and apices of subsequent antennal segments brownish-rust; femora dark brown, tibiae somewhat rusty. Body length 14–20 mm.

Larva (Fig. 66): Well distinguished from the larva of *A. luxuriosa* (Bat.) by less compact spinules on pronotal shield (spinules not touching each other), fewer hairs at anterior margin of pronotum, forming here one or two interlacing transverse rows. Body white, elongate. Head parallel-

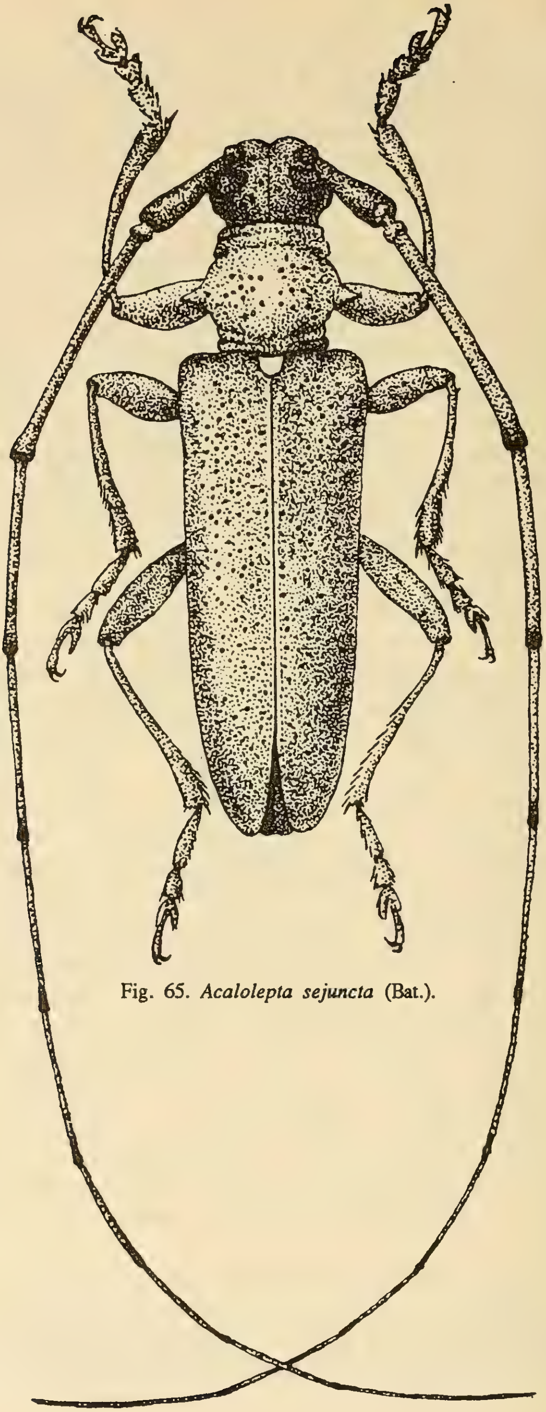
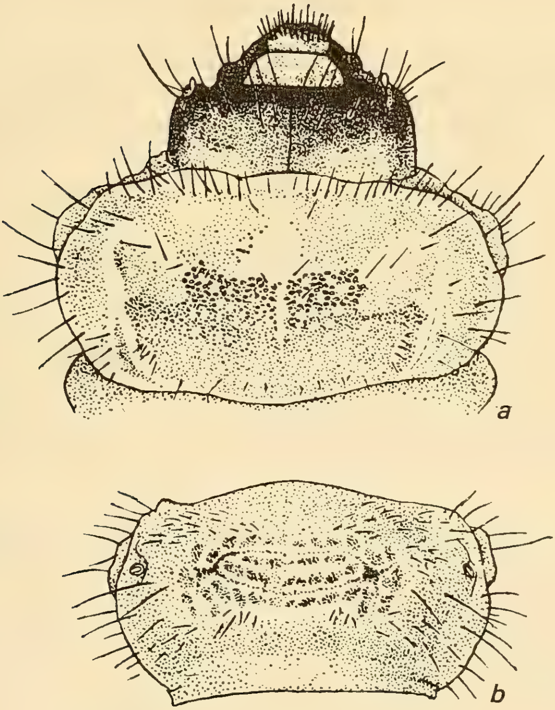


Fig. 65. *Acalolepta sejuncta* (Bat.).

sided. Epistoma slightly convex, almost flat, at anterior margin dark brown, toward middle rusty, in posterior half whitish, medially divided by dark brown longitudinal suture, laterally demarcated by faint frontal sutures, in anterior third with long bristles in transverse row. Hypostoma barely convex, rusty, at anterior margin with perceptible narrow fringe, with straight anterior angles, in anterior third with minute bright pores in transverse row. Temporo-parietal lobes rusty, at anterior margin with dark brown fringe covering antennal sockets from behind, behind fringe with piliform 131 bristles in transverse row. Ampullaceous ocelli below antennae. Antennae very short, not projecting beyond anterior margin of head capsule. Clypeus trapezoid, lustrous, whitish, only basally brownish. Labrum transversely oval, convex, in anterior half with bright rusty bristles, in posterior half glabrous, with fine striae. Mandibles elongate, apically obliquely truncate, with thin cutting edge and curved dorsal and ventral denticles, on inner side with thin ridge extending from ventral denticle to dorsal edge of



132 Fig. 66. Larva of *Acalolepta sejuncta* (Bat.).

a—head and pronotum; b—abdominal tergite with dorsal locomotory ampulla.

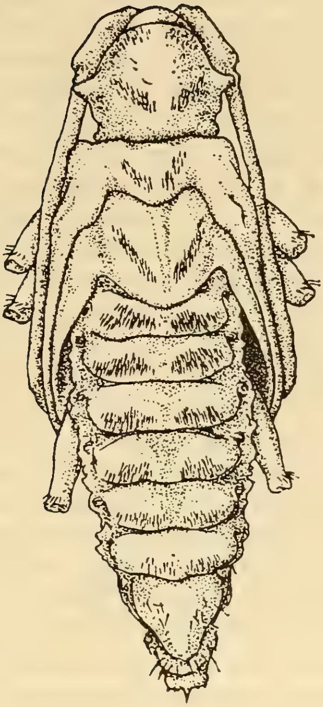
mandible. Laciniae of maxillae digitate, apically rounded, here with short dense bristles.

Pronotum transversely oval, laterally rounded, insignificantly sloping toward head, laterally with sparse setiform, in anterior third with long coarse hairs forming narrow transverse band having one median and two lateral interlacing rows. Pronotal shield insignificantly convex, sclerotized, with dense, much larger spinules in anterior half, minute spinules in posterior half, medially with narrow groove, at anterior angles with rectangular notch, laterally demarcated by longitudinal grooves uniting at anterior angles with transverse depressions (fringed at anterior margin with sparse setiform hairs in an oblique row), in anterior half with round whitish shiny punctures. Mesonotum with narrow transverse groove; metanotum with minute sclerotized granules in two transverse rows. Prothoracic presternum and eusternum (medially) with very sparse short hairs. Eusternum in posterior
132 half and apically glabrous, laterally demarcated by arcuate groove. Meso- and metasterna with two median rows of minute sclerotized granules divided by transverse groove, in anterior half with short setiform hairs in transverse row.

Abdomen elongate, laterally with long sparse hairs, with oval, insignificantly elongate spiracles. Dorsal locomotory ampullae with uniform, distinctly projecting, sclerotized granules forming two inscribed ellipses. Posterior row of this ellipse (especially on tergites V–VII) slightly recurved toward tip of abdomen. Ventral locomotory ampullae with obliquely elongate granules forming two transverse rows divided by deep transverse groove. Segment X apically with coarse setiform hairs forming crown around anal pore. Body length of late instar larvae 27–30 mm, width of head up to 3.0 mm.

Pupa (Fig. 67): Characterized by deep longitudinal groove on frons between antennae, location of long acicular bristles on abdominal tergites forming one compact paramedial brush on each side. Head tapering anteriorly, between antennae with deep troughlike longitudinal groove, frontally with long acicular bristles forming longitudinal row before base of antennae, before clypeus an uneven, dispersed cluster. Clypeus, labrum, and mandibles laterally with long (most often paired) acicular bristles. Antennae in anterior part flexed laterad, between mid- and hind femora bent ventrad. Here spiraled, with three–four (male) or two–three (female) loops.

Pronotum tapering more anteriorly, less posteriorly, laterally with acute conical tubercle, disk convex, uneven, before middle with transverse, barely
133 perceptible depression, near base with narrow transverse groove, with long acicular bristles forming near anterior margin two clusters (separated by narrow interspace), on hind clivus two narrow bands extending from base toward lateral tubercles. Clusters of bristles near anterior margin small



132 Fig. 67. Pupa of *Acalolepta sejuncta* (Bat.).

or greatly elongate, sometimes extending posteriorly almost up to lateral tubercles. Mesonotum longitudinally convex, at posterior margin with insignificantly extended, gently rounded shield, lateral to it with coarse bristles forming two divergent bands. Metanotum convex, lustrous, posteriorly broadly rounded, medially with longitudinal troughlike groove, in posterior half with bristles forming two dense bands that diverge anteriorly from middle of base.

Abdomen adequately elongate (male), gradually tapering from base toward tip (male) or much thicker, in region of segments III–IV enlarged, tapering sharply toward tip (female). Abdominal tergites in anterior half transversely depressed (extended), in posterior half convex, medially with distinct longitudinal groove, paramedially with long dense acicular rusty bristles directed backward and forming cluster on each side. Tergite VII triangular, elongate, apically rounded, in posterior third with bristles forming one or two small clusters. Urogomphus at tip of abdomen markedly or poorly developed, apically with small spinule. Tip of abdomen obtuse ventrally, laterally bound by high ridges bearing small number of large or minute spinules and one bristle basally. Valvifers of females hemispherical, with barely perceptible gap between them, apically with small tubercle. Body length 15–21 mm, width of abdomen 5–6 mm.

Material: Collected on Kunashir Island in the environs of Alekhino and Sernovodsk. Adults 26 (raised from larvae collected in nature), larvae 38, pupae 8 males and 2 females, larval exuviae with beetles from cells 10.

Distribution: Mainly an insular species. Found on Sakhalin, Kunashir, and in Japan. There are reports of the occurrence of these beetles in Korea.

Biology: Found in forests on Kunashir Island. Inhabits broad-leaved and mixed forest. Beetles are found from mid-July up to September. They feed on the bark of young shoots and tissues of green leaves of elm and other host species. Infest the stems and log knots (diameter 4–12 cm) of different woody species. Often appear on newly windfallen and cut trees.

Larvae, pupae, and beetles (in wood) were found by us on elm (*Ulmus laciniata*), Amur cork tree (*Phellodendron sachalinense*), rowan berry (*Sorbus commixta*), and spruce (*Picea microsperma*). The larva initially lives under bark, makes longitudinal, sometimes sinuous galleries, weakly impressed on wood, and fills them with fine frass. It then bores into wood up to a depth of 2–3 cm and there makes a longitudinal gallery upward and fills it with frass. The entry hole left on the wood surface is ovally elongate, longitudinal to the stem, and up to 5–6 mm. However, after penetrating the wood, the larva often returns under the bark. In this case, there are false entry holes on the wood surface that end blindly. For example, of the 19 entry holes examined on a shoot, 12 were false and only in 7 did the larvae remain in the wood up to the end of their development. Late instar larvae, after the second hibernation, make a cell in the upper layer of wood transverse, oblique, or longitudinal to the stem, and separate
134 it from behind by a plug of fibrous frass. A layer of wood 1–3 mm thick remains between the anterior surface of the cell and the bark. Width of gallery under bark 10–14 mm, length of gallery in wood 7–8 cm. Length of cell 2.5–3.5 cm, width 8–12 mm.

Pupation of larvae observed June-end and in July. Pupae remain in the cell with their head upward and develop in about 3.5 weeks. From a larva pupated on July 3rd, the beetle emerged on the 28th of this month. The atmospheric temperature during this period fluctuated from 7°C in the morning to 26°C later in the day (average 16.0 ± 0.3°C). Maximum pupae found in the second half of July. Emergence of beetles begins in the last ten days of July and is completed mid-August. Beetles nibble round openings (5–7 mm diameter) on the shoot surface and emerge through them. Emergence of beetles from wood is completed in late July and August. Total duration of life cycle not less than two years.

Based on 22 individuals in different stages of development, larvae before pupation weigh 125–410 mg, pupae 114–373, beetles before emergence from cells 79.1–271 mg. The growth rates of larvae developing on different woody plant species are not uniform. For example, the larvae taken from shoots of elm weighed before pupation 221.7 ± 23.6 mg, from cork tree 232.4 ± 28.5 mg, and from spruce 303.1 ± 22.3 mg; pupae weighed 201.9 ± 21.4 mg, 208.4 ± 27.5 mg, and 276 ± 20.4 mg respectively; adults 156 ± 17.6 mg, 193.8 ± 22.2 mg, and 211.4 ± 13.6 mg respectively.

Acalolepta sejuncta (Bat.) is found in forests on Kunashir Island comparatively more frequently, damages mature trees and undergrowth with a stem diameter up to 4–12 cm. Once on a stub (length 1.65 m, diameter 12 cm) of a cork tree, we found seven larvae in the wood. On a log (length 13 cm, diameter 7 cm) cut from the branch of a spruce, there were three flight openings through which the beetles had emerged and one pupa still inside. This species, *Molorchus minor* (L.), and *Leontium viride* Thoms. often coinfest shoots of spruce.

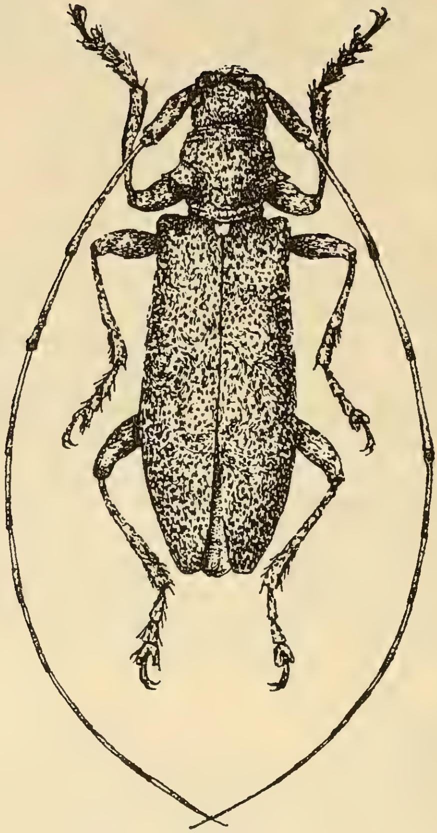
In earlier published works (Krivolutskaya, 1973; Danilevskii and Kompantsev, 1979), this species is related to *Acalolepta fraudator* Bat. inhabiting the islands of Japan. The last species is well distinguished from *A. sejuncta* (Bat.) by the absence of deep bold punctures on the sinciput and frons and more elongate first antennal segment moderately thickened distally.

4. **Acalolepta ussurica** (Plav.)

Plavil'shchikov, 1951. *Tr. zool. muzeya Mosk. un-ta*, 7: 121 (*Dihammus*); Plavil'shchikov, 1958. *Fauna SSSR*, 23, pt. 1: 535–536 (*Dihammus*).

Adult (Fig. 68): Very close to *Acalolepta sejuncta* (Bat.). Distinguished from it by smaller size, absence of flange in anterior third of pronotum, and other characters. Head projecting, with dense compact adherent grayish-yellow pubescence, frons and sinciput with numerous, temples in front with sparse black punctures. Eyes boldly and sharply faceted, broadly emarginate. Antennae extending beyond apex of elytra by 6th (male) or 7th (female) segment, in males 2.5, in females 1.5 times longer than body, with very minute bright adherent hairs mainly on first half of segments. First antennal segment dark brown, thick, insignificantly tapering toward base, entirely with minute bright adherent hairs, almost half length of 3rd segment; 4th segment barely shorter than 5th or almost equal to it; 11th segment long, not shorter than 5th, markedly longer than 10th segment, medially with black ferrule; 3rd–11th segments bright rust, apically dark brown.

Pronotum not longer than basal width, convex, at posterior margin



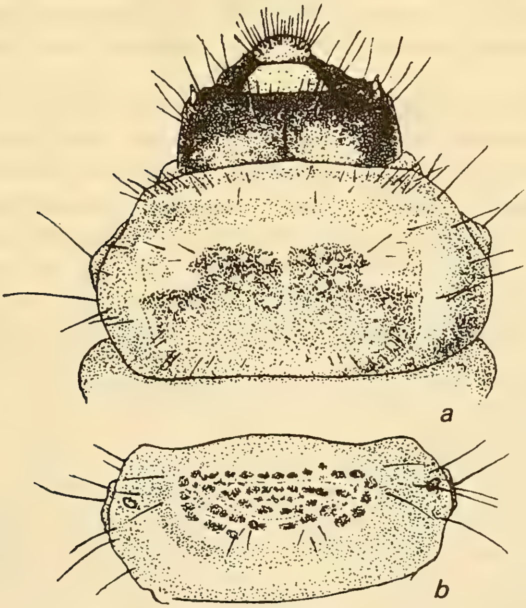
135 Fig. 68. *Acalolepta ussurica* (Plav.).

135 with two transverse grooves, of which posterior groove sharp but anterior groove faint, at anterior margin with curved fringe, here without perceptible flange, at most with barely perceptible transverse groove, laterally with acutely produced, spiniform tubercle, with dense compact adherent grayish-yellow hairs, with numerous large deep punctures on entire disk from posterior to anterior margin and at base of lateral tubercles (in *Acalolepta sejuncta* (Bat.) punctures not extending up to posterior and anterior margins of pronotum). Pronotal shield slightly tapering posteriorly, apically broadly rounded, flat, with compact adherent grayish-yellow pubescence. Elytra parallel-sided (female) or gradually tapering from base posteriorly (male), with projecting straight humeri, convex, apically slightly obtuse, with dense erect compact adherent grayish-yellow pubescence and deep

lustrous punctures distinct throughout surface. Femora thick, more so in second half; hind tarsi somewhat shorter than tibiae; 1st tarsal segment almost equal to next two segments. Body ventrally with dense compact adherent pubescence. Abdominal tergite V in females thick, convex, apically with small depression, with sparse thin semierect bristles, in males slightly convex, apically rounded, without depression, with numerous brownish bristles rising above pubescence. Body length 10–16 mm.

Egg: White, elongate, rounded at poles. Chorion with fine sculpture. Length 1.4 mm, width 0.4 mm.

Larva (Fig. 69): Distinguished from other species of the genus *Acalolepta* Pasc. by distinctly projecting (not fusing) spinules on pronotal shield and other characters. Body elongate. Head parallel-sided, half retracted into prothorax, reddish-rust, at anterior margin dark rust. Epistoma laterally fusing with temporo-parietal lobes (frontal sutures not perceptible), medially divided by dark brown longitudinal suture, at anterior margin laterally with pair of short or long bristles, in anterior half on each side with two–three long and one (sutural) short bristle forming common transverse row. Hypostoma slightly convex, barely tapering anteriorly or almost parallel-



136 Fig. 69. Larva of *Acalolepta ussurica* (Plav.).

a—head and pronotum; b—abdominal tergite with dorsal locomotory ampulla.

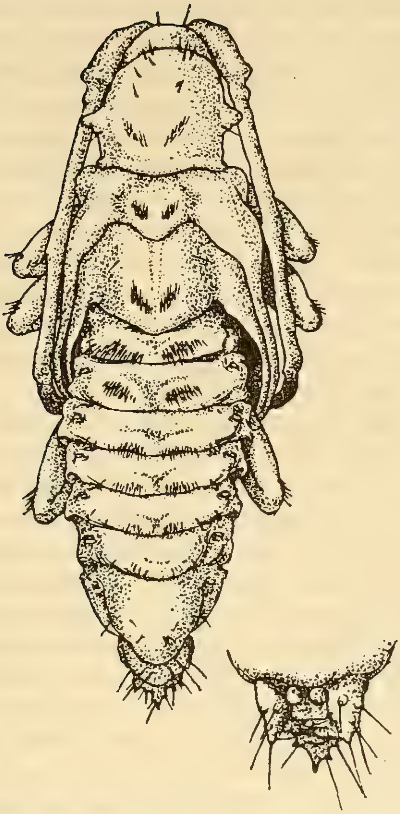
sided at anterior margin broadly emarginate, at anterior angles narrowly rounded, almost straight. Temporo-parietal lobes entirely rusty, near anterior margin with two–three long piliform bristles. Antennae very short, barely projecting from antennal sockets. Ocelli near bases of antennae (in ventral view) barely perceptible. Clypeus large, trapezoid, whitish, basally with somewhat rusty tone. Labrum in anterior half convex, whitish, with dense rusty bristles, basally tapering, rusty, glabrous.

136 Pronotum barely convex, disk almost flat, laterally and before shield somewhat rusty, in anterior third with setiform hairs forming narrow transverse band, behind which lies a pair of wide-set bristles. Pronotal shield with well-discernible, dense rusty-brown spinules imparting general rusty appearance, medially with longitudinal whitish mark, at anterior angles with notch, with numerous round glabrous whitish punctures, laterally demarcated by faint longitudinal grooves extending anteriorly up to transverse triangular depressions, before them with setiform hairs in transverse row. Alar lobes lustrous, yellowish, with two–three bristles. Prothoracic presternum laterally with lustrous yellowish triangular spot, in front of it with individual long hairs forming transverse row. Eusternum convex, triangular, in anterior half with a few hairs forming a separate cluster. Meso- and metasterna in anterior half with short dense hairs forming transverse band, behind it (in posterior half) with two transverse, somewhat rusty bands of minute spinules. These bands sometimes broken into individual granules.

Abdomen elongate, parallel-sided, laterally with long solitary hairs. Dorsal locomotory ampullae moderately convex, with ampullaceous granules covered with minute sclerotized spinules and forming two transversely extended ellipses. Ventral locomotory ampullae with two rows of transversely located ampullaceous granules densely covered with minute sclerotized spinules. Tergite VIII medially with long hairs forming transverse row. Tergite IX in posterior half laterally with long solitary rusty
137 hairs. Body length of late instar larvae up to 25 mm, width of head capsule 2.1 mm.

Pupa (Fig. 70): Characterized by long acicular bristles on sclerotized base dorsally on body and urogomphus at tip of abdomen terminating in sclerotized spinule. Body comparatively thick, moderately elongate. Head appears narrow. Frons medially with longitudinal troughlike groove, laterally inner to eyes with thick bristles forming rarefied cluster, at anterior margin with two pairs of bristles. Sinciput near upper ocular lobes with one–two bristles. Antennae on ventral side of body at level of mid- and hind tibiae spiraled, forming two (female) or three (male) complete loops.

Pronotum convex, laterally with large produced tubercle, basally with narrow transverse groove, foreclivus with long dispersed bristles forming



136 Fig. 70. Pupa of *Acalolepta ussurica* (Plav.) (female).

common setigerous field, with acicular bristles basally forming two short bands diverging laterad. Each lateral tubercle posteriorly at base with one long bristle. Mesonotum convex, posteriorly angularly rounded, at base of shield with long dense lateral bristles slightly directed anteriorly and forming two clusters. One bristle present near base of each elyton. Metanotum moderately convex, medially with longitudinal groove, in posterior half with long coarse paramedial bristles directed anteriorly and forming two bands diverging laterad. Abdomen thick, in region of segments III–IV slightly enlarged, gradually tapering toward tip. Abdominal tergites in posterior half convex, in anterior half transversely depressed, medially with longitudinal groove, on convex part with long acicular bristles directed backward and forming two transversely extended clusters separated by longitudinal groove. Abdominal tergite VII elongate, triangular, apically narrowly rounded, in posterior half with numerous or solitary bristles. Tergite VIII semicircular, convex, medially with four–six bristles in transverse row. Urogomphus at tip of abdomen distinctly produced, with sclerotized spinule. Valvifers of female hemispherical, slightly wide-set. Square at tip of abdomen (ventral view) demarcated by well-expressed ridges uniting posteriorly and bearing small setigerous spinules. Femora on outer side with four–five setiform apical spinules in transverse row. Body length 11–17 mm, width of abdomen up to 5.5 mm.

Material: Collected in the Ussuri-Primor'e region: Kamenushka River, village Kondratenovka, Lake Khasan. Adults 24 (including 13 raised in the laboratory from larvae collected in nature), larvae 26, pupae 4 males and 3 females, larval exuviae with beetles and pupae from cells 19.

Distribution: Ussuri-Primor'e region: Partizansk (Kamenushka River), Kondratenovka, Lake Khasan (Golubinsk cliff).

Biology: Inhabits broad-leaved forests of the Ussuri-Primor'e region. Ecologically associated mainly with maple (*Acer*) and elm (*Ulmus*). Beetles fly in July and first half of August. They infest the basal (underground) part of stems 2–8 cm diameter. The female initially makes a cavity 3.0 mm × 3.5 mm, then lays an egg under the bark. Larvae of the first and midinstars live under bark, make upward longitudinal sinuous galleries slightly impressed on sapwood and fill them with frass. Larvae of late instars bore into wood before the second hibernation and there make upward galleries, filling them with frass. After the second hibernation, they make a pupal cell longitudinal to the stem in the upper part of the gallery and
138 pupate in it with their head upward. A layer of wood up to 2.0 mm thick remains between the cell and the bark. Length of gallery under bark up to 15 cm, width 8–20 mm. Width of entry hole into wood 4.5–5.0 mm. Length of gallery in wood up to 10 cm. Length of pupal cell 2–3 cm, width 8–10 mm. Pupation begins in the first half of June and is completed during early July. Maximum pupae observed during the last ten days of June. Developed beetles remain in wood for about seven days, then nibble round openings (up to 4–5 mm diameter) on the stem surface (shoots), and exit the wood through them. Emergence of beetles from wood begins by June-end and concludes mid-July. Generation—two-year cycle.

Insect weight reduction during metamorphosis is quite significant. A larva (female) before pupation weighed 232 mg (100%), the pupa formed from it 182 mg (78.4%), and the beetle developing from this pupa before emergence from cell 120 mg (51.7%). In another instance, nine pupae weighed 1,435 mg (100%), while the beetles developing from them before emergence from cell weighed 1,155 mg (80%), i.e., the total weight of the insects during the pupal stage reduced by 20%. Based on 24 individuals in different stages of development, larvae before pupation vary in weight from 56 to 232 mg (144.6 ± 9.7), pupae 51 to 185 mg (130.3 ± 8.5), beetles before emergence from cell 42 to 167 mg (106.1 ± 7.3).

Acalolepta ussurica (Plav.) is found in isolated pockets. It damages maple and ash. One small locus was found by us near the village Kondratenovka. During an inspection of this locus, we collected 33 specimens (larvae, pupae)—22 from maple and 11 from ash. The damage done by *Acalolepta ussurica* (Plav.) is readily determined by the presence of round flight openings in the basal part of stems. Generally, one or two insects develop in the basal part of each stem 2–8 cm diameter.

5. **Acalolepta degenera** (Bat.)

Bates, 1873. *Ann. Mag. Nat. Hist.*, 4, 12: 310 (*Monochammus*); —*longicornis* Pic, 1905. *Mat. Longic.*, 5, 1: 8 (*Astynoscelis*); Gressit, 1951. *Longic. Beetles of China*, 2: 397, 400 (+ ab. *nanus* Gangl.); Plavil'shchikov, 1958. *Fauna SSSR*, 23, pt. 3: 536–538 (*Dihammus*); Kojima and Hayashi, 1960. *Insects' Life in Japan*, 1: 125.

Adult (Fig. 71): Characterized by whitish or grayish indistinct spots on elytra. Head slightly bent, with compact adherent yellowish hairs and large deep punctures; spaces between punctures with minute, barely perceptible, dense punctation producing fine shagreen sculpture. Frons convex, medially with narrow longitudinal groove. Eyes highly emarginate, sharply faceted, upper ocular lobe barely broader than interception between it and lower lobe. Antennae long, tapering toward apex, extending beyond apex of elytra by 6th (male) or 8th (female) segment. Third antennal segment 1.5 times longer than 4th; 11th segment with perceptible flange beyond middle, apically acute.

Pronotum apically slightly less wide than at base, laterally with acute conically extended tubercle, disk convex, with deep bold punctation and compact adherent yellowish-golden hairs curved from the sides mediad and backward. Pronotal shield entire, posteriorly rounded, with dense gray adherent hairs. Elytra convex, humeri enlarged, tapering in posterior half, apically with narrowly rounded inner angle, in anterior half (particularly at base) with deep bold, in posterior half fine (vanishing) punctation, with minute adherent golden-yellow and white hairs and indistinct adjacent spots.
139 Legs thick, short; femora in second half enlarged, perceptibly flat, tapering toward apex, with gray adherent hairs and sparse deep punctures. Hind tarsi perceptibly shorter than tibiae; 1st tarsal segment slightly longer than 2nd. Body ventrally with dense adherent gray hairs, with sparse deep lustrous punctures. Abdominal sternites highly (female) or slightly (male) convex. Sternite V broad, with recurved (female) or elongate, much flatter, straight apical margin (male). Body and legs black; 1st antennal segment black,

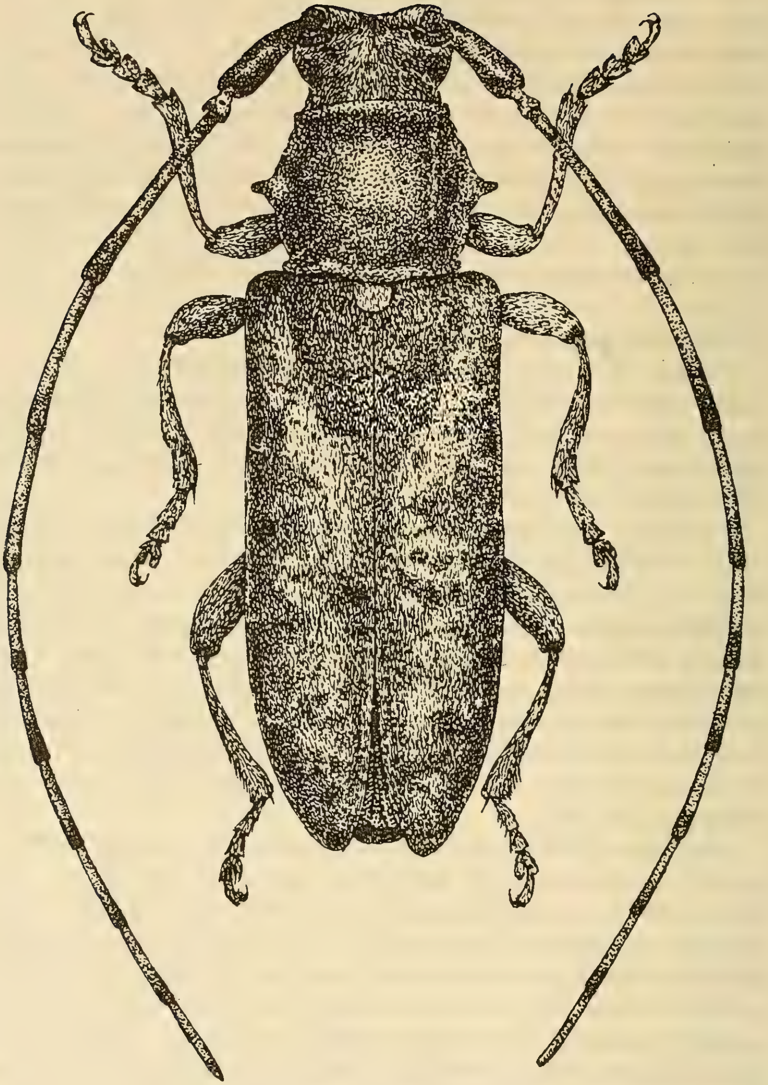


Fig. 71. *Acalolepta degenera* (Bat.).

remaining segments somewhat rusty, apically blackened. Elytra dark brown or black with variegated pubescence forming on disk indistinct, longitudinally fusing white spots. Often these spots faint (f. typica), sometimes forming longitudinal broken band (ab. *nanus* Gangl.) or producing general grayish tone (ab. *praecanus* Plav.). Body length 7.5–13 mm.

Egg: White, with greenish tinge, moderately elongate, at poles acute or sharply rounded. Chorion with fine sharp cellular sculpture. Alveoli uniform, almost round, spaces between them narrow, septile. Length 1.6 mm, width 0.5 mm.

140 *Larva* (Fig. 72): Body comparatively small, white. Head half retracted into prothorax, barely tapering anteriorly. Epistoma laterally barely demarcated, medially with groovelike longitudinal suture, somewhat rusty, posteriorly with transverse whitish band, at anterior margin laterally with three, on disk in anterior half with six long bristles in transverse row. Hypostoma tapering anteriorly slightly convex, somewhat rusty, at anterior margin broadly emarginate, medially with narrow white band. Temporo-parietal lobes at anterior margin rusty, in remaining part much brighter, near antennal base (ventral side) with convex black lustrous ocellus. Antennae short, barely projecting from antennal sockets. Clypeus lustrous, whitish, basally somewhat rusty. Labrum apically rounded, convex, in anterior half with thin bristles.

Pronotum twice wider than long, laterally rounded, markedly sloping toward head, in anterior third with sparse dispersed setiform hairs forming

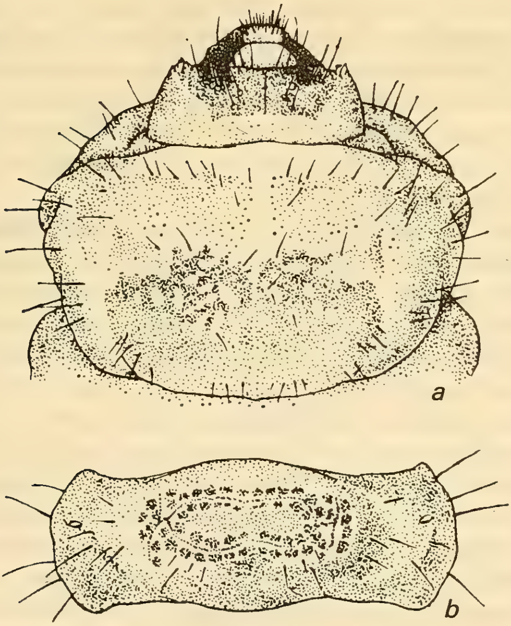


Fig. 72. Larva of *Acalolepta degenera* (Bat.).

a—head and pronotum; b—abdominal tergite with dorsal locomotory ampulla.

transverse band, medially before shield with solitary hairs in transverse row, laterally and in second fourth on disk yellowish. Pronotal shield convex, laterally demarcated by curved longitudinal grooves, at anterior angles with notch, here with transverse triangular depression, with dense minute sclerotized spinules and numerous large white, at places fusing, punctures. Alar lobes glabrous. Prosternum with very sparse, short setiform hairs forming clusters laterally on presternum and on disk of eusternum as well as laterally on its basal part (basisternum). Eusternum convex, laterally well demarcated.

Abdomen gradually tapering toward tip, laterally with long sparse 141 hairs. Dorsal locomotory ampullae moderately convex, with median common longitudinal groove, with minute ampullaceous granules forming two transversely extended ellipses. Granules with very minute sclerotized spinules. Ventral locomotory ampullae with two transverse rows of poorly sclerotized ampullaceous granules, between them with deep transverse groove. Tergite VIII and sternite VIII lustrous, medially with long hairs in transverse row. Body length of late instar larvae 15–18 mm, width of head up to 2.0 mm. First instar larvae with relatively broad body and hypostoma divided into two triangular sclerites.

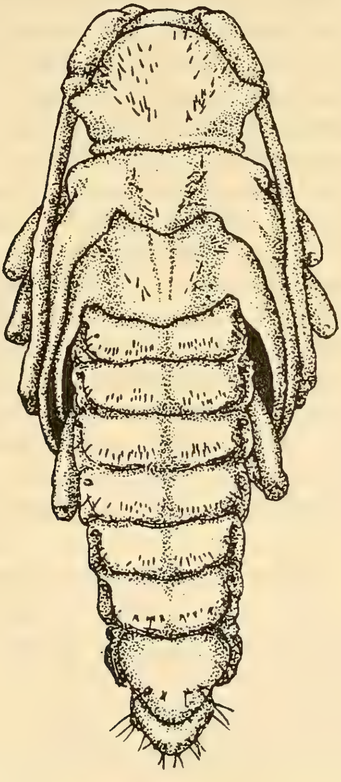
Pupa (Fig. 73): Distinguished from other species by rounded, barely perceptible urogomphus. Body moderately elongate. Head highly projecting, medially (between antennae) with broad longitudinal trough. Laterally inner to antennae and before clypeus with acicular bristles forming two longitudinal bands—the posterior (preantennal) band slightly lateral to the other (anterior) one. Antennae flexed laterad, on ventral side spiraled, with two (female) or three (male) loops.

Pronotum not longer (female) or barely longer (male) than basal width, convex, lustrous, laterally with large conical tubercle, in anterior half with numerous long acicular bristles forming common field medially with longitudinal interruption that is sometimes observed only at anterior margin. On hind clivus of pronotum bristles perceptibly shorter and concentrated in two compact bands diverging anteriorly. Mesonotum convex, posteriorly with angularly produced shield, lateral to which coarse bristles forming two small clusters or two bands extending from shield to base of elytra. Metanotum broad, posteriorly rounded, medially with longitudinal groove, in posterior half with a few acicular paramedial bristles forming two diverging bands. Abdomen moderately elongate, barely (female) or markedly (male) tapering toward tip. Abdominal tergites convex, medially with common longitudinal groove, paramedially in posterior half with short setigerous spinules forming narrow transverse band. Spinules small, often barely perceptible or imperceptible, bristles near their bases long, well developed. Tergite VII large, convex, at posterior margin comparatively narrowly (male) or broadly (female) rounded, in posterior half with large setigerous spinules in transverse row, usually with pair of lateral bristles. Tergite VIII short, medially with four small setigerous spinules in transverse row. Tip of abdomen obtuse, laterally bound by U-shaped ridge bearing small acute setigerous spinules. Urogomphus at tip of abdomen round, indistinct. Valvifers of females elongate, apically rounded, bent toward each other. In males, tip of abdomen between ridges with pair of wide-set, small round tubercles. Body length 8–14 mm, width of abdomen 3–4 mm.

Material: Collected in the Ussuri-Primor'e region. Adults 31, larvae 36, pupae 5 males and 2 females, larval and pupal exuviae 3.

Distribution: Ussuri-Primor'e region, China, Korea, Japan.

Biology: Inhabits open forest glades, roadside grass patches and, often, meadow areas. Ecologically associated with herbaceous plants. Beetles 142 fly from June-end up to mid-August. In 1980 in the southern spurs of



140 Fig. 73. Pupa of *Acalolepta degenera* (Bat.).

the Sikhote-Alin range, the maximum number of beetles was observed mid-July. Beetles feed on green tissues, scraping them from the stems of herbaceous plants (*Artemisia laciniata* and others), and live up to three–four weeks. After mating, the females begin to oviposit. They settle on the stems of wormwood (*Artemisia laciniata*). The female first removes the soil around the stem with its head, next makes a slitlike (generally longitudinal to the stem) cavity in the bark in the basal part of the stem using its mandibles, then with its head upward, introduces its ovipositor into the cavity, and lays an egg under the bark. One egg is laid on each stem. Diameter of infested stems in underground part 3–6 mm. One female can infest up to 15 stems during its life span. We found 14 mature eggs in the ovaries of a female that had not yet begun oviposition. At a temperature of 12.6–25°C (average 18.3 ± 0.3°C) larvae hatched from eggs after 20–24 days (average 21.8 ± 0.1). We kept 46 eggs under observation. After hatching, larvae initially remain under bark and nibble a small square in it; then they bore into the stem and gradually move through the heartwood to the basal zone. After the first hibernation, larvae feed on the tissues of roots and the underground part of fresh (young) stems. After the second hibernation, they make a cell in the root and fill it from top to bottom with fibrous frass, forming a compact plug. Length of upper plug up to 7.0 mm, lower plug up to 8.0 mm. Length of cell 13–16 mm, width 4–6 mm. Larvae pupate in the cell with their head upward.

Pupation of larvae begins in the first half of June and continues up to the last ten days of July. Maximum pupae observed June-end and during the first ten days of July. Pupae develop in about three weeks. Emergence of beetles from pupae commences at the beginning of the last week of June and is completed by July-end or even early August. We caught the first beetles in Partizansk on June 27th and the last at Petrov-Kordon near Sokolovka at August-end. Generation—two-year cycle (Table 14).

The insects of this species are characterized by low weight indices. Based on seven males, larvae in the prepupal phase weigh 25–53 mg (36.3 ± 3.5), pupae 22–48 mg (32.7 ± 3.3), beetles before emerging from cell 18–36 mg (25.7 ± 2.4). The respective weights of eight females were

Table 14. Development of *Acalolepta degenera* (Bat.)

Year	May	June	July	August	September	October
1st	L	LPA	LPAE	AEL	EL	L
2nd	L	L	L	L	L	L
3rd	L	LPA	LPAE	AEL	EL	L

34–62 mg (54.3 ± 3.1), 30–55 mg (49.2 ± 2.9), and 24–47 mg (40.1 ± 2.5). Males are notably smaller than females. However, prior to the prepupal phase, the weight of larvae is considerable. For example, 15 larvae, which had initiated the second hibernation, varied in weight from 26 to 82 mg (average 47.2).

Acalolepta degenera (Bat.) is found in large numbers at places and infests a considerable number of plants. In one field, 21 plants (*Artemisia laciniata*) were examined, of which 6 were infested by this insect.

143 28. Tribe ANCYLONOTINI

This tribe is predominantly found in the Ethiopian region. In northern Asia, it is represented by only one genus.

1. Genus *Palimna* Pasc.

Pascoe, 1862. *Journ. Ent.*, 1: 346;—*Apalimna* Bates, 1884. *Journ. Linn. Soc. Lond. Zool.*, 18: 241–242; Gressit, 1951. *Longic. Beetles of China*, 2: 433; Plavil'shchikov, 1958. *Fauna SSSR*, 23, pt. 1: 562–563.

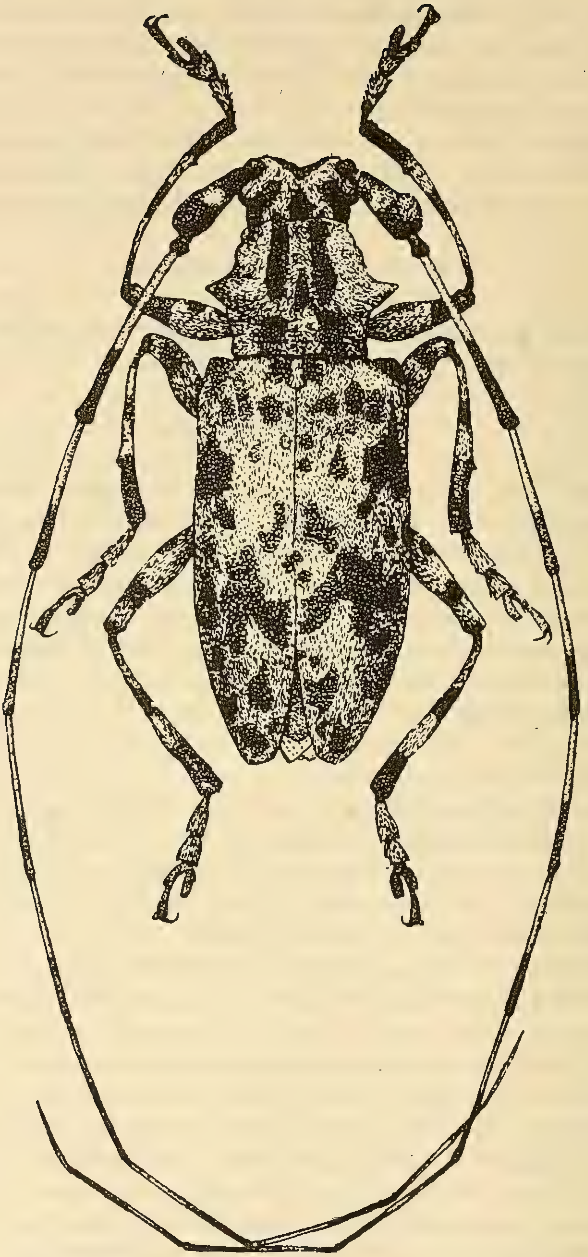
In northern Asia, only one species of this genus is known. In southeast Asia, there are about ten species. All the species are ecologically associated with broad-leaved forests and belong to the group of Tertiary fauna.

Type species: *Colsinda tessellata* Pascoe, 1857 (= *Cerambyx annulatus* Olivier, 1792).

1. **Palimna liturata** (Bat.)

Bates, 1884. *Journ. Linn. Soc. Lond. Zool.*, 28: 242 (*Apalimna*); Gressit, 1951. *Longic. Beetles of China*, 2: 434;—*liturata continentalis* Semenov-Tian-Shanskij, 1914. *Russk. entomol. obozr.*, 14: 20 (*Apalimna*); Plavil'shchikov, 1956. *Fauna SSSR*, 23, pt. 1: 563–565; Kojima and Hayashi, 1969. *Insects' Life in Japan*, 1: 135.

Adult (Fig. 74): Characterized by compact pubescence of short scaly hairs forming common variegated grayish background. Head highly retracted into prothorax. Frons broad, convex, with upwardly produced antennal tubercles, medially with longitudinal groove passing over to sinciput, with sparse granular punctation. Temples, genae, anterior margin of frons with dense adherent white pubescence. Sinciput and occiput with dense hairs forming white band bordering upper ocular lobes from base of antennae laterad in form of branches from middle of sinciput. Upper side of head with black spot surrounded by dense white hairs. Antennae long, 2.5 (male) or 1.6 (female) times longer than body, extending beyond apex of elytra by 6th (male) or 7th (female) segment, dark brown, with dense compact



144 Fig. 74. *Palimna liturata* (Bat.).

adherent white hairs basally. Cicatrix at apex of 1st antennal segment elongate, gentle, with fine transverse striae. Eyes broadly emarginate, sharply faceted; upper ocular lobe half width of lower lobe.

Pronotum transverse, near apex and at base with broad flange, laterally with acute conical tubercle, disk convex, with minute, barely perceptible punctation and dense adherent scaly hairs, with five black spots distinct against pubescence—two longitudinally elongate along sides near anterior margin, two much broader along sides at base, and one longitudinally elongate, narrow, raised in the center. Sometimes lateral spots fusing longitudinally form two parallel bands. Pronotal shield flat, posteriorly broadly rounded, medially with narrow longitudinal white pilose band or broad triangular spot, laterally dark brown.

Elytra parallel-sided, convex, apically jointly rounded, with humeral tubercles projecting forward sharply, in anterior half (especially at base) with deep bold, toward apex much finer vanishing, on humeral tubercles granular punctation, with dense compact adherent white scaly extended hairs, with minute round and large, transversely extended, black spots
144 (covered with black hairs) forming uneven transverse bands on disk beyond middle and laterally before middle. Body ventrally with gray adherent hairs. Abdominal sternite V in males flat, apically obtuse, in females convex, as though inflated, apically rounded. Femora thickened, covered with compact adherent white hairs, on outer side with black spot in middle and near apex. Tibiae near apex and in middle with white pilose ringlet. First and 2nd segments of tarsi with white, 3rd segment with dark brown hairs. Body length 16–20 mm.

Larva (Fig. 75): Body elongate, white. Head half retracted into prothorax, in anterior third tapering roundly. Epistoma insignificantly convex, at anterior margin broadly emarginate, here on each side with three bristles (of which two nearer sides and one inner shifted mediad), in anterior half dark rust, in posterior half bright rust, medially throughout length divided by longitudinal suture, laterally demarcated by fully perceptible frontal sutures, disk nearer to anterior margin with two paramedial bristles, of which the inner vis-à-vis the outer projecting backward. Hypostoma parallel-sided, poorly convex, almost flat, with rounded anterior angles, reddish-rust, medially with white longitudinal gular band, at anterior margin, base, and near gular band dark brown. Temporo-parietal lobes reddish-rust, ventrally much darker, at anterior margin almost black, in anterior half with solitary piliform bristles. Antennae whitish or hyaline, short, their apices barely projecting from antennal sockets. Ocelli small, ampullaceous, shifted below antennae by two diameters of ocellus per se. Clypeus large, trap-
145 ezoid, convex, whitish basally with somewhat rusty tinge, with faint longitudinal streaks. Labrum transverse, apically broadly rounded, posteriorly

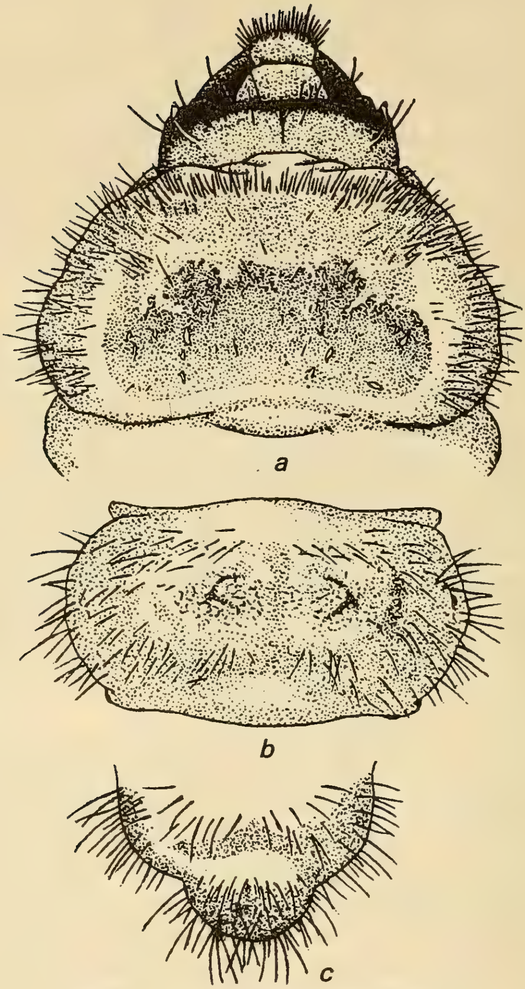


Fig. 75. Larva of *Palimna liturata* (Bat.).

a—head and pronotum; b—abdominal tergite with dorsal locomotory ampulla; c—tip of abdomen (ventral view).

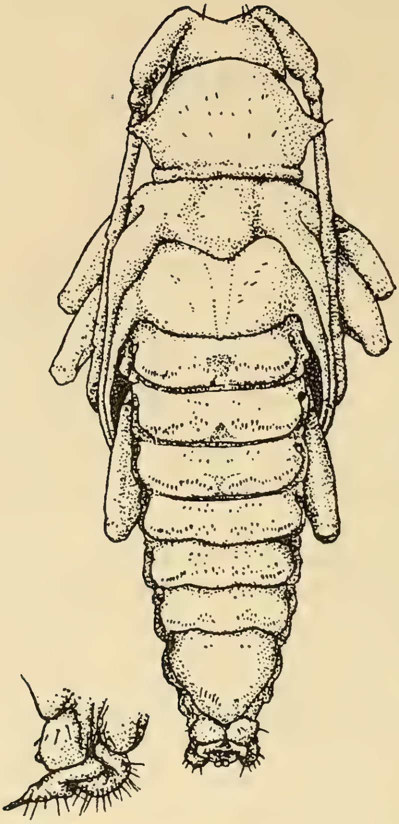
glabrous, anteriorly with dense bright rust bristles. Mandibles reddish-rust, apically black, here obliquely or slightly truncate, on inner side ovally hollowed, with acute transverse ridge extending from ventral to dorsal denticle.

Pronotum transverse, laterally rounded, slightly more tapering anteriorly, laterally with sparse, at anterior margin behind whitish fringe with dense rusty hairs forming comparatively broad transverse field, disk and laterally somewhat rusty, medially with narrow longitudinal white band, near this band with three pairs of hairs, of which middle pair shifted more mediad, posterior hairs shifted laterad. Pronotal shield somewhat rusty, compactly sclerotized, with very minute sclerotized spinules visible under high magnification, with whitish punctures forming two longitudinally extended clusters at anterior margin along sides, with dispersed, very short setiform hairs, laterally demarcated by deep longitudinal folds, at anterior angles emarginate, here with distinct depression. Prosternum glabrous, with
146 dense rusty hairs, laterally with lustrous yellow spot, basally in anterior part of sternellum (basisternum s. sternellum) sclerotized, with dense minute spinules forming transverse band with rusty tinge. Meso- and metasterna coriaceous, without sclerotization, medially with barely perceptible transverse groove, in anterior half with sparse minute bright rusty hairs.

Abdomen elongate, laterally with not very dense, short rusty hairs. Dorsal locomotory ampullae convex, ellipsoid, transversely elongate, with minute ampullaceous granules (forming transversely extended medial cluster and an outer ellipse uniformly transversely extended), medially with common longitudinal groove. Granules with very minute, specklike brownish spinules visible under high magnification. Ventral locomotory ampullae medially in region of longitudinal groove with interception, with uniform ampullaceous granules forming one convex paramedial cluster. Abdominal tergites VIII and IX in posterior half and laterally with minute bright hairs, disk in anterior half glabrous, lustrous. Anal segment terminally with numerous rusty or bright rust hairs. Body length 24–28 mm, width of head 2.0–2.5 mm.

Pupa (Fig. 76): Body moderately elongate, white. Head before antennae parallel-sided, significantly elongate, medially with longitudinal punctate groove passing over to occiput, beyond antennae with one short bristle, near base of antennae on inner side with two adjacent bristles, at inner margin of lower (anterior) and upper (posterior) ocular lobes with one–two bristles, at base of clypeus on each side with three short spiniform bristles forming one common transverse row widely interrupted medially. Labrum apically angularly produced, disk convex, with short rusty bristles forming distinct uniform transverse band medially. Antennae long, on ventral side of body spiraled, with two–three loops, flexed from ventral side toward fore- and midlegs.

Pronotum transverse, laterally with produced conical tubercle, tapering more toward apex, less toward base, near posterior margin with perceptible transverse groove, disk convex, here with very minute dis-



145 Fig. 76. Pupa of *Palimna liturata* (Bat.).

persed bristles. Mesonotum at posterior margin with obtusely produced shield, beyond middle transversely (saddlelike) depressed, laterally with very short bristles in two rows diverging anteriorly from shield toward base of elytra. Metanotum convex, lustrous, with median longitudinal groove enlarging anteriorly, with very minute sparse bristles forming uniform row on each side, extending obliquely from longitudinal groove toward anterior angle.

Abdomen gradually tapering toward tip. Abdominal tergites at posterior margin more convex, here with acute spinules directed backward and forming transverse row, near row in front with very minute, specklike spinules forming here and there second transverse row, in anterior half broadly depressed (or as though compressed), here on disk with minute acute spinules forming short uneven transverse row or small transversely

extended cluster. Abdominal tergite VII triangular, posteriorly narrowly rounded, disk convex, in posterior third with short spiniform bristles forming interlacing transverse, highly recurved row. Tergite VIII transverse, highly convex, lustrous, medially with minute bristles forming rarefied interlacing transverse row. Tip of abdomen (posterior view) obtuse, bound
147 laterally by ridges bearing large number of bristles, with large urogomphus produced on dorsal side and terminating in an acute sclerotized spinule. Valvifers of female small, compactly contiguous, at apex with small projecting tubercle. Body length 16–19 mm, width of abdomen 5–6 mm.

Material: Collected in the Ussuri-Primor'e region. Adults four, larvae four, pupae two (male and female), larval and pupal exuviae with beetles from cells four.

Distribution: Ussuri-Primor'e region, North Korea, northeast China, Japan.

Biology: Inhabits broad-leaved forest zones. Ecologically associated with hornbeam and other deciduous woody plant species. Beetles fly mainly in the second half of July and the first half of August. Larvae live in and under bark of drying trees, generally make upward-down longitudinal sinuous galleries barely impressed in upper layer of wood, and fill them with fine frass. Pupal cell made at end of gallery and the larva pupates in it with its head downward. The cell lies longitudinal to the stem and is impressed on sapwood. Length of gallery 10–15 cm, width 0.8–2.1 cm. Here and there the gallery becomes squarish. Length of pupal cell 24–28 mm, width 8–11 mm.

Pupation of larvae in June and early July. Young beetles appear from mid-July. Pupal stage lasts about three weeks. Under natural conditions, a beetle emerged from a pupa on the 18th day of pupation. Weight of larvae before pupation 117–192 mg, pupae 105–175 mg, young beetles before emergence from cell 85–147.5 mg. Generation—not less than two years. Larvae were collected from the basal (underground) and middle parts of stems 15–16 cm diameter. We raised beetles from the larvae collected from hornbeam (*Carpinus cordata*) and maple (*Acer* sp.). According to reports by the Japanese authors Kojima and Okabe (1960) and others, this insect develops on hornbeam (*Carpinus laxiflora*, *C. tochonoskii*), beech (*Fagus japonica*, *F. crenata*), oak (*Quercus mongolica*, *Q. serrata*), maple (*Acer mono*), and birch (*Betula maximowicziana*).

29. Tribe MESOSINI

Adults: Distinguished from representatives of Monochamini by short broad body and hairs on inner side of antennae. Pronotum generally parallel-sided, barely tapering anteriorly, laterally without tubercle, basally and apically without flange. Elytra broad, short, apically jointly rounded. Hind wings well developed. Legs not very long, equal in length. Midtibiae without distal notch on outer margin.

Larvae: Body moderately elongate. Head flat, slightly retracted into prothorax. Epistoma distinctly demarcated from temporo-parietal lobes, frontal sutures well developed. Locomotory ampullae of abdomen with sharp granules forming dorsally two–three, ventrally two transverse rows.

Pupae: Characterized by annularly curved antennae. Pronotum without lateral tubercle, parallel-sided or slightly tapering anteriorly, with minute spinules. Abdominal tergites with numerous short spinules. Tip of abdomen roundly obtuse, laterally with minute setigerous spinules. Urogomphus absent.

The fauna of Mesosini is richly represented in the Indo-Malayan region and depauperate in North America. Within the limits of the Soviet Union, only one genus (*Mesosa* Latr.) is known, which is characteristic of northern Asia.

148 1. Genus *Mesosa* Latr.

Latreille, 1829. In Cuvier: *Regne Anim. Ins.*, ed. 2: 124; Gressit, 1951. *Longic. Beetles of China*, 2: 413 (type: *Lamia curculionoides* Fabr.); Plavil'shchikov, 1958. *Fauna SSSR*, 23, pt. 1: 549–550; Mamaev and Danilevskii, 1975. *Lichinki zhukov-drovosekov*, 185.

Adult: Characterized by comparatively short, broad body. Head short, not narrower than pronotum, with produced antennal tubercle, frontally with broad median longitudinal groove. Eyes highly emarginate, divided almost into two equal lobes, lower lobe slightly larger than upper. Antennae markedly longer than body (male) or barely extending beyond apex of elytra, on inner lower side with long dense bristles. Pronotum transverse, parallel-sided, narrower than elytra, basally and apically without sharp flange. Elytra short, broad, apically jointly rounded, in anterior third with coarse, simple or granular (*M. curculionoides* (L.)) punctation. Legs not long, almost uniformly developed, femora sufficiently thickened. Sternite V uniformly, not highly, convex, with median longitudinal troughlike groove (female) or without it (male).

Larva: Body moderately elongate, white. Head parallel-sided, insignificantly retracted into prothorax. Epistoma with well-developed frontal sutures, divided throughout length by median suture, in anterior third with eight setigerous pores, with minute longitudinal dots extending posteriorly from them (*M. senilis* Bat., *M. hirsuta* Bat.) or with four–six groovelike depressions (*M. myops* (Dalm.), *M. curculionoides* (L.)). Hypostoma in posterior half with longitudinally extended lateral spinule (*M. myops* (Dalm.), *M. curculionoides* (L.)) or without it (*M. senilis* Bat., *M. hirsuta* Bat.), in posterior half insignificantly (*M. hirsuta* Bat.) or highly (*M. senilis* Bat.) convex. Locomotory ampullae granular, developed on segments I–VII of abdomen. Tergite IX with distinct spinule (*M. myops* (Dalm.), *M. japonica* Bat., *M. curculionoides* (L.), *M. hirsuta* Bat.) or without it, here only with barely perceptible, specklike sclerotized formation (*M. hirsuta* Bat.).

Pupa: Distinguished by numerous large acute setigerous spinules on abdominal tergites forming two transverse rows—one at anterior margin, the other at posterior margin. Spinules directed backward but on abdominal tergites V–VI spinules of posterior row bent forward.

In northern Asia, five species of the genus *Mesosa* Latr. are known. Of these, *M. curculionoides* (L.) is found in Europe and the southern Urals, *M. myops* (Dalm.) extends from the Atlantic Ocean coasts to the Pacific Ocean coasts, *M. hirsuta* Bat., *M. senilis* Bat. and *M. japonica* Bat. are found in the eastern part of northern Asia. In Japan 13, and in southeast Asia, more than 20 species are known. All these species are ecologically associated with deciduous woody and bushy plant species. Larvae live in and under bark. In some species, they bore into wood for pupation. Generation—usually two-year cycle. The insects hibernate as midinstar larvae and as adults. They infest drying (standing) and freshly felled trees. They are categorized as under-the-bark pests.

Type species: *Cerambyx curculionoides* Linnaeus, 1761.

149 KEY TO SPECIES

Adults

1 (8). Pronotal disk and elytra without dense erect hairs.
2 (7). Elytra basally with granular punctation. Pronotum laterally with four black spots.
3 (6). Elytra without round black oculate spots, with transverse bands.
4 (5). Pronotum in region of anterior black spots pitlike but not depressed, only with transverse, barely expressed flange. Elytra basally with comparatively minute granular and simple punctation. Eurasia . . . . 1. **M. myops** (Dalm.)
5 (4). Pronotum in region of anterior black spots pitlike, depressed. Elytra basally with only somewhat bold granular punctation, without simple punctation. Southern Sakhalin, Kunashir, Japan . . . . 2. **M. japonica** Bat.
6 (3). Elytra with large round black oculate spots. From coast of Altantic Ocean to the southern Urals . . . . . 3. **M. curculionoides** (L.)

7 (2). Elytra basally with simple punctation, without granules. Pronotum laterally with longitudinal bands. Islands of eastern Asia . . . . 4. **M. senilis** Bat.

8 (1). Pronotal disk and elytra with dense erect hairs. Eastern part of northern Asia . . . . 5. **M. hirsuta** Bat.

Larvae

1 (8). Abdominal tergite IX with well-developed apical spinule.

2 (7). Hypostoma in posterior half with large lateral spinule. Epistoma in anterior third with four–six groovelike depressions extending backward from setigerous pores.

3 (6). Abdomen laterally with sparse hairs. Dorsal locomotory ampullae of abdomen posteriorly with uneven granules forming uneven transverse row.

4 (5). Shield of pronotum faintly striate. On deciduous woody plant species . . . . 1. **M. myops** (Dalm.)

5 (4). Shield of pronotum sharply longitudinally striate. Mainly on elm and oak . . . . 2. **M. japonica** Bat.

6 (3). Abdomen laterally with dense hairs. Dorsal locomotory ampullae of abdomen posteriorly with uniform granules forming even transverse row. Mainly on oak. . . . . 3. **M. curculionoides** (L.)

7 (2). Hypostoma in posterior half without spinule, here highly convex. Epistoma in anterior third with minute uniform streaks extending backward from setigerous pores. On deciduous woody plant species, mainly on birch, poplar, and alder . . . . . 4. **M. senilis** Bat.

8 (1). Abdominal tergite IX without well-developed apical spinule, only with barely perceptible, specklike sclerotized formation. On bird cherry, ash, willow, and other deciduous species . . . . 5. **M. hirsuta** Bat.

Pupae

1 (6). Labrum on disk with bristles forming transverse band.

2 (5). Abdominal tergite V at posterior margin with spinules directed forward.

150 3 (4). Mesonotum laterally with spinules forming small cluster . . . . 1. **M. myops** (Dalm.)

4 (3). Mesonotum laterally with numerous minute setigerous spinules forming large cluster extending from apex of shield to base of elytra . . . . 2. **M. japonica** Bat.

5 (2). Abdominal tergite V at posterior margin with spinules directed

backward. . . . . 4. **M. senilis** Bat.

6 (1). Labrum on disk with bristles forming compact uniform transverse row . . . . 5. **M. hirsuta** Bat.

1. **Mesosa myops** (Dalm.)

Dalman, 1817. In Schönherr: *Syn. Ins.*, 1, 3, Append.: 168 (*Lamia*); Polozhentsev and Kucherov, 1952. *Entomol. obozr.*, 32: 176–181; Romadina, 1954. *Tr. zool. in-ta AN SSSR*, 16: 221; Plavil'shchikov, 1958. *Fauna SSSR*, 23, pt. 1: 550–558; Cherepanov and Cherepanova, 1975. *Zhukidrovoseki ivovykh lesov Sibiri*, 135–139.

Adult (Fig. 77): Easily recognized by broad stocky body and four
151 oculate spots on pronotum. Body comparatively thick, stocky. Head short, broad, frontally almost square, with compact adherent gray and yellow hairs forming characteristic small yellowish spots, occiput with simple vanishing, sinciput and frons simple and fine granular punctation, medially with narrow longitudinal groove passing over from frons to region of sinciput. Genae broad, twice longer than lower ocular lobe, with bold granular punctation. Eyes up to posterior margin broadly emarginate, finely faceted; lower ocular lobes slightly larger than upper ones. Antennae significantly longer (male) or barely longer (female) than body, extending beyond apex of elytra by 8th (male) or 11th (female) segment, with short adherent hairs, on inner side with dense semierect bristles. Third antennal segment slightly curved, perceptibly longer than 1st segment.

Pronotum transverse, basally with narrow transverse groove, apically with gentle transverse flange, disk convex, uneven, medially with short longitudinal groove, compactly punctate, laterally with lustrous black granules, with gray and yellow adherent hairs, with four velvety black oculate spots laterally fringed with yellowish-rust hairs. Two of the oculate spots large, located laterally on anterior flange, two smaller laterally at base. Shield posteriorly rounded, laterally with sparse, medially with dense yellow adherent hairs forming here a longitudinal yellow band. This band often barely perceptible, sometimes disappears and hence imperceptible.

Elytra short, broad, convex, parallel-sided, apically jointly rounded, beyond humeri slightly depressed laterally, basally inner to humeral tubercle with small depression, in posterior half with curved margin, at base laterally with much denser large, on oval part with sparse minute punctures, and tender gray and dense yellow hairs in patches forming characteristic pattern. Legs short, densely pilose. Body ventrally with dense hairs. Abdominal sternite V uniformly convex (male) or with median longitudinal groovelike depression (female), in which case apically with long dense setiform hairs. Body black or blackish-brown. Antennae black or dark brown. Third to 11th antennal segments rusty basally, here with white

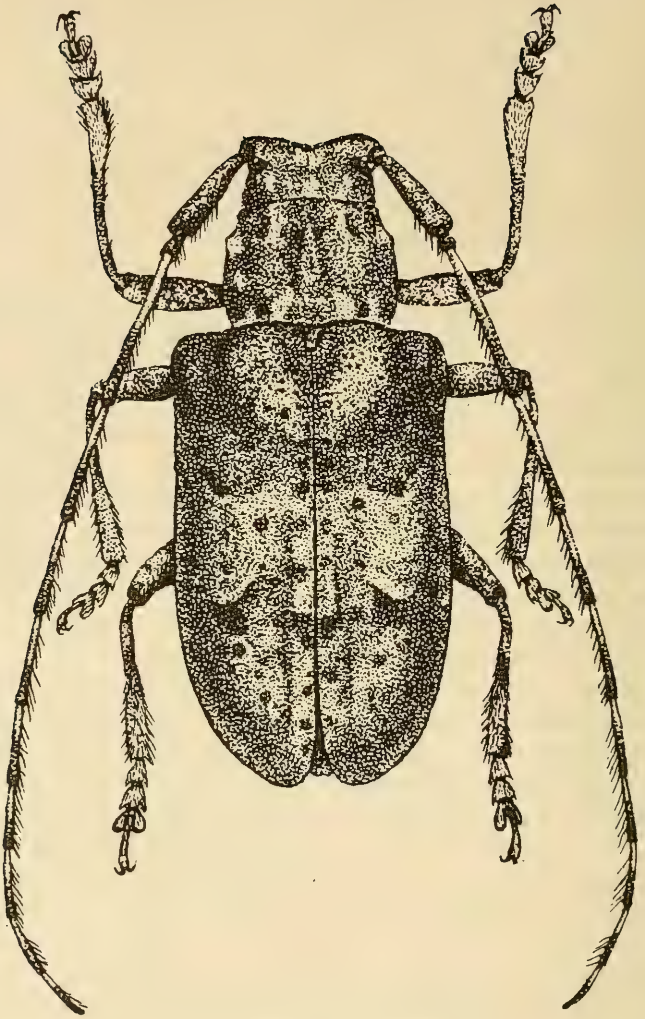


Fig. 77. *Mesosa myops* (Dalm.).

hairs, apically black or dark brown, with brownish hairs; 1st segment entirely black. Body length 8–16 mm.

Egg: White, elongate, tapering toward poles. Chorion matte, smooth, without cellular sculpture. Length 2.5 mm, width 0.8 mm.

Larva (Fig. 78): Characterized by two spinules laterally on hypostoma, longitudinal streaks on epistoma, and other characters. Head parallel-

sided, slightly retracted into prothorax. Epistoma triangular, insignificantly convex, somewhat rusty or rusty-red, at anterior margin, especially at angles, with much darker brownish-black tone, here laterally with pair of short, medially with two long bristles, in anterior third with eight setigerous pores in transverse row (with short troughlike streak extending backward from each pore), laterally demarcated by sharp whitish frontal sutures, medially throughout length divided by longitudinal (median) suture. Hypostoma slightly tapering anteriorly, almost parallel-sided, at anterior angles rounded, dark or bright rust, medially with narrow white band, in posterior half with lateral, longitudinally extended spinule, with dark brown flat, tubercular or spinous convexity extending inward from this spinule and terminating sometimes near medial line, in anterior half with pair of bristles lateral to longitudinal white band. Temporo-parietal lobes rusty, on lower
152 side reddish-rust, at anterior margin much darker, rusty-brown, in anterior half with solitary setiform hairs. Antennae whitish, very short, barely projecting from antennal sockets. Ocelli below latter, whitish. Clypeus large, trapezoid, whitish, at base partially somewhat rusty. Labrum transverse,

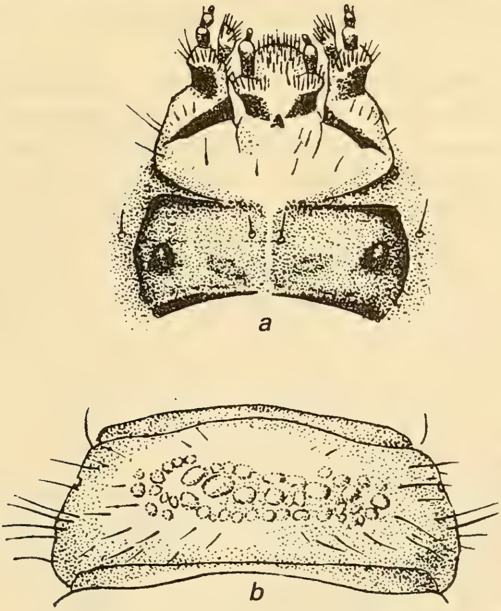


Fig. 78. Larva of *Mesosa myops* (Dalm.).

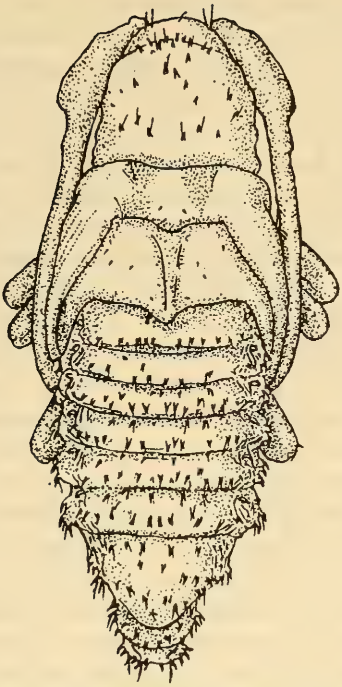
a—head in ventral view (hypostoma); b—abdominal tergite with dorsal locomotory ampulla.

apically gently rounded, basally glabrous, rusty, in second half more convex, whitish, with dense rusty bristles. Mandibles thick, black, apically obliquely truncate, with rounded dorsal and slightly elongate ventral denticle, on inner side matte, with thin ridge extending from longitudinal margin toward apex of ventral denticle.

Pronotum transversely oval, laterally rounded, at anterior margin with broad white fringe, beyond it before middle with broad transverse lustrous yellow band passing laterad, before it with dense setiform hairs forming narrow transverse field broadly interrupted medially by lustrous glabrous interspace. Pronotal shield coriaceous, white, finely striate, at anterior margin and on disk with individual setiform hairs, laterally demarcated by deep longitudinal folds. Before these folds occur flat depressions set with hairs. Pronotum laterally with rusty hairs. Prothoracic presternum with dense rusty hairs, laterally with very large lustrous glabrous spot. Eusternum densely pilose, basally glabrous, coriaceous. Basal part of prosternum (basisternum s. sternellum) glabrous, coriaceous, laterally with somewhat rusty hairs. Meso- and metasterna with median transverse groove dividing two rows of ampullaceous granules, in anterior half with short hairs forming interlacing transverse row or narrow transverse band. Thoracic legs absent, only in some late instar larvae present as small brownish-rust warts.

Abdomen elongate, laterally with not very dense bright hairs. Dorsal
153 locomotory ampullae convex, with narrow median longitudinal groove and minute ampullaceous granules forming transversely oval field bearing three to four rows of granules. Tergite IX with sparse dispersed hairs. Sternite IX at posterior margin with 8–10 long hairs forming interlacing or straight transverse row, before it with long dispersed lateral hairs. Body length of late instar larva 23–25 mm, width of head up to 4.0 mm. Interstadeal variation is indicated by the fact that in the first instar larvae, segments I–VIII of the abdomen bear one lateral sclerotized spinule directed backward. The hypostoma is smooth, laterally without spinules. The lateral spinules of the abdomen disappear after molt. Spinules appear later on the hypostoma.

Pupa (Fig. 79): Characterized by stocky, comparatively thick body, numerous spinules on abdominal tergites, and other characters. Head frontally flat, broad, in front of antennae parallel-sided, medially with barely perceptible narrow longitudinal groove, near base of antennae on inner side with pair of long thin bristles, before antennae near lower ocular lobes with three bristles forming transverse row slightly directed forward. Antennae in second half on ventral side annular (male) or semicircular (female), their apices inclining toward 3rd antennal segment (male) or toward foretarsi (female).



152 Fig. 79. Pupa of *Mesosa myops* (Dalm.).

Pronotum transverse, insignificantly less in length than width, with acute, slightly produced posterior and straight anterior angles, at posterior margin without perceptible notches (posterior margin almost straight), disk uniformly convex, medially with barely perceptible longitudinal groove, with acute setigerous spinules, among which two transverse rows are distinguishable—one near anterior margin and second in the middle (in *Mesosa japonica* Bat., spinules on pronotum comparatively short, forming less distinct transverse rows). Mesonotum slightly convex, medially slightly depressed transversely, saddlelike, at posterior margin with slightly produced shield, laterally with minute spinules forming row extending from apex of shield toward base of elytra. Metanotum broad, at posterior margin angularly produced, insignificantly convex, medially with troughlike longitudinal groove, laterally with minute setigerous spinules forming somewhat rarefied row extending obliquely from posterior margin of longitudinal groove toward anterior angle (in *M. japonica* Bat., spinules laterally on meso- and metanota forming very large cluster).

Abdomen gradually tapering from base toward tip. Abdominal tergites uniformly convex, with narrow, barely perceptible, median longitudinal groove. Tergites I–VI with long acute setigerous spinules forming two transverse rows—one at anterior margin, the second at posterior. Spinules recurved, only on tergites V–VI in posterior rows bent forward. In the first case, a bristle arises posteriorly from the base of each spinule and in the second, from the front. Abdominal tergite VII triangular, posteriorly narrowly rounded, sufficiently convex, with large acute setigerous spinules forming three uniform or interlacing transverse rows—the anterior row consisting of 12–16, medial row of two (on disk), and the posterior row of 6–8 spinules. Spinules of anterior and medial rows recurved and those of posterior row bent forward. In many individuals, there are additional spinules laterally on this tergite, forming here individual clusters or a lateral transverse row. Tergite VIII short, with acute minute spinules forming complete uniform or interlacing transverse row. Tip of abdomen obtuse, bound by U-shaped ridge having large sclerotized setigerous spinules. Valvifers of female appear to be set on an extended base, hemispherical, small, wide-set. Body length 10–18 mm, width of abdomen 4–5 mm.

154 *Material*: Collected in the southern Urals, western and eastern Siberia, and the Ussuri-Primor'e region. Adults 2,370, larvae 1,390, pupae 30 males and females, larval exuviae with beetles from cells 32.

Distribution: From the Baltic to the Pacific Ocean coasts; from the southern Urals, northern Kazakhstan, northern Mongolia, Amur region in the south to the middle belt of the taiga zone in the north. Found in large numbers in the southern regions of western and eastern Siberia.

Biology: Inhabits deciduous and mixed forest zones. Ecologically associated with deciduous woody plant species. Found in large numbers in field-protection plantation strips in the forest-steppe and steppe zones. Beetles hibernate in forest litter. In the spring, with the commencement of warmth, they emerge from sites of hibernation and feed on bark of thin dry shoots of willow, elm, and other woody plant species. After mating, the females oviposit on stems and thick log knots of elm, willow, oak, and other deciduous woody and even bushy plant species. For this purpose, the female first makes a cavity up to 2.0 mm long in the bark using its mandibles, then introduces its ovipositor into it, and lays an egg under the bark. A female can lay 30 or more eggs during its life span. The insects infest felled trees as well as physiologically weakened, drying trees still standing on their roots and also the stubs and exposed roots. Oviposition is observed from May to June.

Development of eggs in nature from the moment of laying to the moment of larval hatching at a temperature of 19.5 ± 1.0°C continues for 10–18 days, on average 15.8 ± 0.7 days, we kept 23 eggs under observation. Hatching of larvae begins in June and is completed in July. The larva in hatching breaks the chorion and immediately begins to nibble the bark, filling the egg shell with frass. It then makes a gallery under the bark upward longitudinal to the stem and fills it compactly with fine frass consisting of bark. Galleries are generally not impressed on sapwood. In the second half of summer, the larva makes a cell longitudinal to the stem at end of the gallery under bark. The cell is insignificantly impressed in sapwood and rarely made in wood at a depth up to 12 mm. Length of larval gallery 25–30 cm, width 8–9 mm. Length of pupal cell 20–30 mm, width 6–12 mm.

Pupation of larvae begins in the last days of June and is completed early August. Maximum pupae observed in the second half of July. Pupae lie in the cell with their head upward. According to observations made in nature, pupae develop from 14 to 20 days—average 15.9 days (19 pupae kept under observation). The atmospheric temperature during this period fluctuated from 13.8°C in the morning to 32.2°C later in the day (average 22.1 ± 0.5°C). Beetles emerge from the pupae in the second half of July (mainly during the last ten days) and in August. They remain in the cell for about one week, then nibble oval openings 5 mm × 6 mm on the bark surface and exit through them. Emergence of beetles from cells begins by July-end or early August and is concluded by August-end or early September. Between the sexually mature (after hibernation) and young (going for hibernation) generations of beetles, there is an interval of about one month. For example, in the Kulundinsk forest-steppe in the systematic collection during the season, 305 beetles were caught—18 sexually mature beetles in May and June, 287 young beetles in August and September. In July, no beetles were found on the trees. Sometimes the flight of sexually mature beetles is protracted, in which case the intervening period between the two generations disappears. The impression is created that beetles fly throughout the entire warm season (from May to September). Change in weight during metamorphosis was determined with 17 individuals; larvae before pupation weigh 2,190 mg (100%), pupae developed from them 1,855 mg (84.7%), beetles before emergence from cells 1,471.5 mg (67.1%). Based on 50 individuals in different stages of development,
155 larvae before pupation weigh 67–343 mg (151.4 ± 8.3), pupae 61–312 mg (134.6 ± 7.8), young beetles 49–260 mg (108.2 ± 6.5).

Young beetles feed on the bark of dry thin shoots of different deciduous woody or bushy plant species. In winter, they enter the litter with underdeveloped gonads. After hibernation, during winter, they commence supplementary feeding, then begin to reproduce.

In 1978, in the southern Urals at the end of July, we simultaneously found on the selfsame trees larvae before pupation, pupae, larvae of early instars, and even dead beetles of the previous year (in cells). This confirms that *Mesosa myops* (Dalm.) infests the same trees several times and develops through a two-year life cycle (Table 15).

Table 15. Development of *Mesosa myops* (Dalm.)

Year	May	June	July	August	September
1st	A	AEL	EL	L	L
2nd	L	LP	LAP	LAP	A
3rd	A	AEL	EL	L	L

Mesosa myops (Dalm.) infests many deciduous woody plant species. From the larvae collected in nature, we raised more than 330 beetles—74 on oak, 67 Manchurian walnut, 39 elm, 22 *Acanthus*, 21 maple, 15 willow, 14 apple, 12 each ash and alder, 9 European bird cherry, 7 each lime and hornbeam, 6 Amur cork tree, 5 aspen, 4 each poplar, oleaster, and pear, 3 each apricot and rowan berry, and 1 each on spindle tree, hawthorn, and birch. In addition, during forest inspections, 1,270 specimens (larvae, pupae, beetles) were collected—484 from willow, 343 oak, 184 Manchurian walnut, 77 elm, 53 lime, 29 aspen, 23 poplar, 18 Amur cork tree, 16 ash, 10 rowan berry, 7 European bird cherry, 5 hornbeam and peashrub, 4 birch, 2 aralia, pear, maple, and ash, and 1 from currant, filbert, and *Eleuterococca.*

2. **Mesosa japonica** Bat.

Bates, 1873. *Ann. Mag. Nat. Hist.*, 4, 12: 312; Plavil'shchikov, 1958. *Fauna SSSR*, 23, pt. 1: 553–554; Kojima and Hayashi, 1969. *Insects' Life in Japan*, 1: 143 (*M. myops japonica* Bat.).

Adult: Distinguished from the closely related species *Mesosa myops* (Dalm.) by absence of median longitudinal yellow pilose band on pronotal shield and presence of coarse punctation at base of elytra, not only laterally but also near the shield. Body stocky, appears thick. Head frontally parallel-sided, with coarse compact punctation, spaces between punctures with fine shagreen sculpture, medially with deep narrow longitudinal groove, with minute gray and golden-yellow hairs (resembling specks). Eyes highly emarginate, finely faceted, between upper and lower ocular lobes with very narrow interception. Antennae extending beyond apex of elytra by 8th (male) or 10th (female) segment, with minute adherent hairs, on inner side with dense bristles.

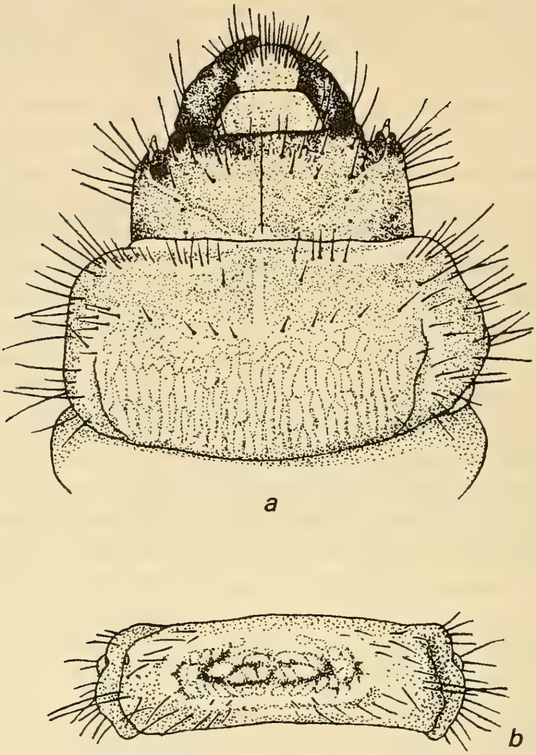
Pronotum transverse, on disk convex, quite uneven, medially with deep longitudinal groove, laterally in region of anterior black spots with pitlike depression (barely perceptible in *Mesosa myops* (Dalm.)), on disk with simple, laterally granular punctation, with gray adherent and golden-yellow hairs resembling specks. Velvety black spots faint. Pronotal shield narrow, triangular, apically narrowly rounded, medially with gray hairs, without yellow longitudinal band.

156 Elytra convex, parallel-sided, with projecting straight humeri, in anterior third with dense bold simple and granular punctation (large punctures present not only near humeri but also near shield), in remaining part with minute sparse punctures, with minute gray and brownish hairs and golden-yellow hairs resembling specks. Body ventrally in females with denser, in males with less dense adherent pubescence and with semierect thin gray hairs. Abdominal sternite V in females basally with deep longitudinal groove, apically with long black hairs, in males entire, without longitudinal groove. Body black. Antennae variegated, apically black or blackish-brown; 3rd–11th segments basally rusty. Body length 11–16 mm.

Larva (Fig. 80): Very similar to the larva of *Mesosa myops* (Dalm.). Distinguished from it by dense pubescence laterally on pronotum, less distinct transverse row of hairs at posterior margin of abdominal sternite IX. Head parallel-sided, slightly retracted into prothorax. Epistoma triangular with somewhat rusty, in anterior half much browner tone, at anterior margin with narrow dark rust fringe, behind it with eight setigerous pores forming transverse row, laterally with sharp bright frontal sutures, medially divided by longitudinal suture. Hypostoma laterally angularly or uniformly rounded, barely convex, in posterior half with distinct lateral spinule, somewhat rusty, with narrow median white band, near it in anterior half with pair of bristles in transverse row. Temporo-parietal lobes rusty, near anterior margin with setigerous pores in transverse row. Antennae
157 whitish, very short. Sclerotized ocelli below antennae, one on each side. Clypeus large, trapezoid, whitish, basally somewhat rusty-red. Labrum transversely oval, tapering toward base, at anterior margin broadly rounded, in anterior half with dense bristles. Mandibles comparatively thick, apically steeply truncate, with rounded dorsal and slightly elongate ventral denticle.

Pronotum transverse, at anterior margin with whitish fringe, behind it with yellowish transverse band divided by narrow whitish median longitudinal streak, at anterior margin with short bright hairs in transverse interlacing row. Pronotal shield convex, white, coriaceous, longitudinally striate, laterally demarcated by deep longitudinal folds. Prothoracic presternum convex, with dense, somewhat rusty hairs, laterally with very large lustrous yellow spot. Eusternum basally glabrous, coriaceous, apically with short bright hairs.

Abdomen parallel-sided, elongate, laterally with long dense hairs. Dorsal locomotory ampullae moderately convex, coriaceous, with lustrous granules forming transversely elongate ellipse having up to three rows of granules. Ventral locomotory ampullae with two transverse rows of oblique granules divided by deep transverse groove. Abdominal sternite IX at posterior margin with 8–10 thin setiform hairs forming transverse, sometimes interlacing row (in *M. myops* (Dalm.) these hairs thick and form simple



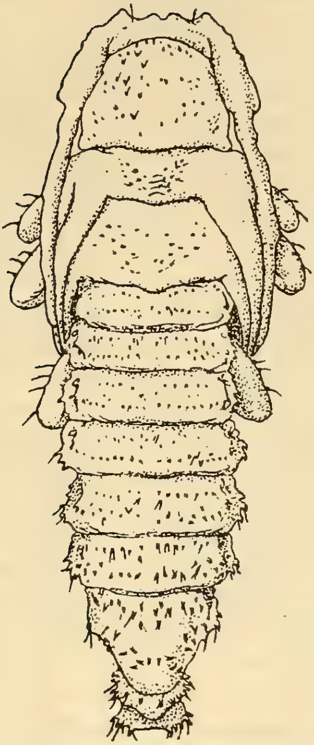
156 Fig. 80. Larva of *Mesosa japonica* Bat.

a—head and pronotum; b—abdominal tergite with dorsal locomotory ampulla.

row). Body length of late instar larvae 18–20 mm, width of head 3.0 mm.

Pupa (Fig. 81): Distinguished from *M. myops* (Dalm.) by location of spinules on meso- and metanota and some other minor characters. Head slightly tapering anteriorly, almost parallel-sided, medially between antennae with broad longitudinal trough, before antennae with long bristles forming an interlacing row extending obliquely forward and toward medial line. Labrum transverse, frontally broadly rounded, apically and basally with dense bristles forming two transverse bands. Antennae beyond midfemora curved semicircularly on ventral side, their apices flexed toward stomatic apparatus.

Pronotum transverse, slightly tapering anteriorly, with acute posterior and straight anterior angles, at posterior margin slightly emarginate twice, here gently rounded medially, disk convex, with barely perceptible lon-



156 Fig. 81. Pupa of *Mesosa japonica* Bat.

gitudinal groove, almost entirely with minute dispersed setigerous spinules; three transverse interlacing rows occur among these spinules—one row near anterior margin, second in middle, and third on hind clivus (in *Mesosa myops* (Dalm.) these rows more distinct). Mesonotum slightly convex, posteriorly with barely raised shield, with numerous setigerous paramedial spinules forming two extensive clusters extending from apex of shield toward base of elytra. Metanotum convex, with broad median longitudinal groove, at posterior margin angularly produced, with dispersed, very minute setigerous paramedial spinules occupying major part of metanotum (in *M. myops* (Dalm.) these spinules form distinct row extending backward from anterior angles toward middle of posterior margin).

Abdomen weakly elongate, tapering posteriorly. Tergites I–VI uniformly convex, with narrow median longitudinal groove bearing numerous acute spinules forming two transverse rows—one at anterior, the other at posterior margin; spinules recurved, only in posterior row bent mainly

forward. Tergite VII triangular, posteriorly narrowly rounded, disk suf-
158 ficiently convex, with numerous large spinules forming interlacing transverse row basally, a cluster apically, and a cluster each laterally. Slightly behind anterior row on disk with two spinules in transverse row. Tergite VIII transverse, with short acute setigerous spinules forming transverse row. Tip of abdomen obtuse, bound posteriorly by distinct ridge bearing four setigerous spinules and numerous long thin bristles. Valvifers of female small, hemispherical, wide-set, on produced base. Body length 15–16 mm, width of abdomen 4.5 mm.

Material: Collected on Kunashir: adults four, larvae ten, pupae one male and two females, larval exuviae with beetles from cells two.

Distribution: Sakhalin, Kunashir, Japan. An insular species.

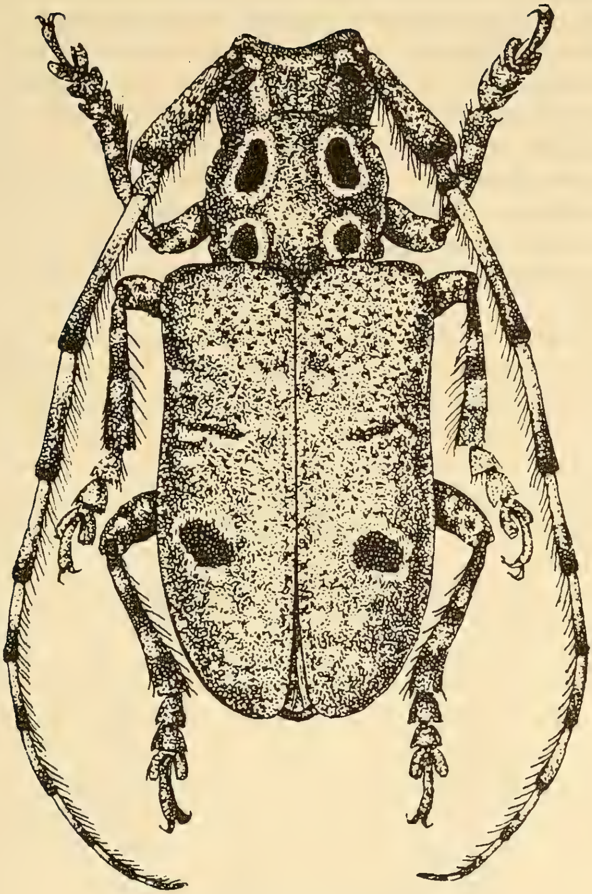
Biology: Inhabits deciduous and mixed forest plantations. Ecologically associated with elm, oak, and other deciduous woody plant species. Beetles fly in the first half of summer. They infest stems and knots 3–10 cm diameter and transitional or even thin bark. Larvae live in and under bark, make longitudinal sinuous galleries usually impressed deeply in sapwood, and fill them with fine frass. After the first hibernation, July-end or in August, the larvae make a cell in the upper layer of wood and sometimes line its sides with coarse fibrous frass. They pupate with their head directed opposite to the larval gallery. Larvae rarely make cell in bark. Length of gallery under bark 10.5 cm or more, width 7–15 mm. Length of cell 15–24 mm, width 8–13 mm.

In 1974, pupation began on Kunashir Island during the first half of August. Young beetles appeared in the cells at the end of this month. Beetles overwintered and started reproducing the following spring. Generation—two-year cycle. Based on three individuals, larvae before pupation weigh 213–246 mg, pupae 194.3–224 mg, young beetles before emergence from cell 162–183 mg. *Paraclytus excultus* Bat. is sometimes found with this species on the very same trees.

3. **Mesosa curculionoides** (L.)

Linnaeus, 1761. *Fauna Suec.*, ed. 2: 193 (*Cerambyx*); Romadina, 1954. *Tr. zool. in-ta AN SSSR*, 16: 220–221; Plavil'shchikov, 1958. *Fauna SSSR*, 23, pt. 1: 554–557.

Adult (Fig. 82): Readily recognized by large round black spots on pronotum, yellowish pilose fringe on elytra, and granular punctation in their anterior third. Head with highly produced frontal tubercles at base of antennae, median longitudinal groove, dense gray and yellow adherent hairs, and deep punctures. Eyes broadly emarginate; upper ocular lobes slightly, lower lobes highly convex, upper lobes almost not shorter than lower. Antennae longer than body, with short adherent hairs, on inner



159 Fig. 82. *Mesosa curculionoides* (L.).

side with dense bristles. First antennal segment with sparse deep punctures, black; remaining segments somewhat rusty, apically black.

Pronotum transverse, slightly tapering anteriorly, disk convex, with dense adherent gray hairs and large deep punctures visible among dense pubescence, with four black round spots having distinct yellow pilose fringe; of these spots, two laterally near apex much larger and two at base somewhat smaller. Pronotal shield triangular, apically rounded, flat, with uniform gray adherent hairs.

Elytra comparatively short, broad, convex, near shield along suture insignificantly depressed, parallel-sided, hind clivus steeply inclined, with
159 barely projecting humeral tubercle, apically jointly rounded, with gray

dense compact adherent and yellow specklike hairs, in anterior third with granular, in remaining part simple punctation, with two black spots having yellow pilose fringe in front and behind; anterior smaller spot before middle, posterior larger spot before hind clivus (f. typica). Sometimes anterior black spots transversely extended as a band fringed with yellow hairs posteriorly (ab. *anticefasciata* Plav.) or anterior spots on elytra absent and only posterior round spots present (ab. *bioculata* Nicol.); sometimes black spots on elytra present only laterally in anterior half (ab. *nigronotata* Pic). Very rarely individuals are found in which the spots on the pronotum fuse into a black longitudinal lacertus (ab. *tokatensis* Pic). Body length 8–18 mm.

Larva (Fig. 83): In structure of hypostoma, similar to the larva of *Mesosa myops* (Dalm.). Distinguished from it by barely perceptible characters. Head parallel-sided, slightly retracted into prothorax. Epistoma

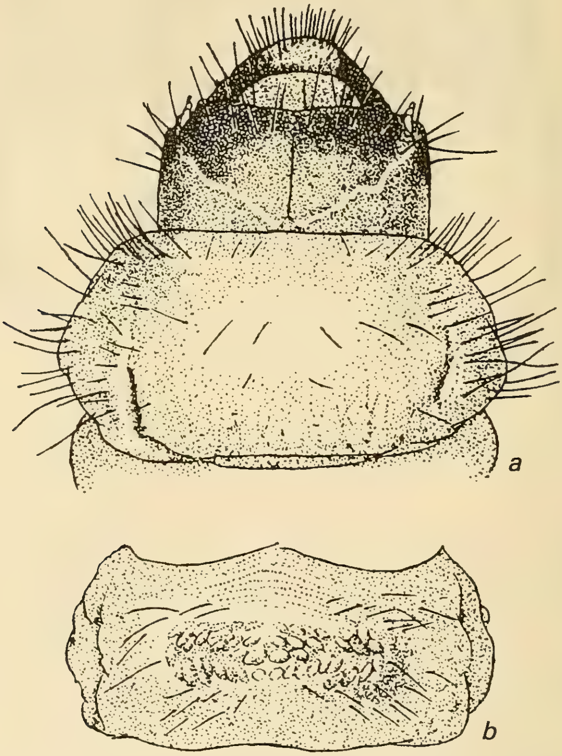


Fig. 83. Larva of *Mesosa curculionoides* (L.).

a—head and pronotum; b—abdominal tergite with dorsal locomotory ampulla.

reddish-rust, at anterior margin with narrow dark brown (almost black) fringe, beyond it with eight long setiform hairs. Longitudinal uneven streaks running posteriorly from these hairs include two–three short paramedial grooves. Frontal sutures and medial suture distinct. Hypostoma rusty, medially with narrow longitudinal white band, in anterior half with paramedial pair of setigerous pores, laterally slightly rounded or parallel-sided, barely
160 convex, in posterior half (near posterior angles) with lateral, longitudinally extended spinule rounded apically, and brownish transverse band arising from it. Temporo-parietal lobes ventrally reddish-brown, dorsally lighter in color, in anterior half behind ocular-antennal zone with long hairs in transverse row. Clypeus large, trapezoid, whitish, basally with brownish tinge. Labrum somewhat rusty, apically narrowly rounded, in anterior half with dense brownish bristles. Mandibles black, elongate, apically truncate, with extended lower and insignificantly projecting dorsal denticle.

Pronotum at anterior margin behind whitish fringe with a few lateral hairs forming transverse row, behind them and laterally glabrous, with rusty sheen, before anterior angles of shield and laterad with long hairs forming lateral cluster. Pronotal shield insignificantly convex, coriaceous, finely striate, laterally demarcated by short deep longitudinal grooves. Prothoracic presternum moderately convex, with long thin hairs, laterally with yellowish glabrous lustrous spot. Eusternum apically and laterally with hairs, basally glabrous, coriaceous. Meso- and metasterna with ampullaceous granules forming two transverse rows divided by transverse groove, in anterior half and laterally with long thin hairs.

Abdomen elongate, laterally with numerous thin bright hairs (in *Mesosa myops* (Dalm.) hairs here far sparser). Dorsal locomotory ampullae divided by common longitudinal groove, transversely oval, with ampullaceous granules forming in anterior half a cluster, posteriorly a uniform transverse row covering this cluster laterally. Ventral locomotory ampullae divided by transverse groove, slightly curved backward, comprising ampullaceous granules forming one row behind transverse groove and small cluster ahead of it. Abdominal tergite IX almost semicircular, disk convex, apically with small acute sclerotized spinule, lateral to it with long hairs forming interlacing transverse row, basally with six–eight hairs forming complete transverse row, disk paramedially with long dispersed hairs. Body length of late instar larvae 16–22 mm, width of head up to 2.8 mm.

161 *Material*: Collected in the European part of the USSR. Adult one, larvae five (obtained from the Department of Entomology, Voronezh Forestry Institute). Collections of the Zoological Museum, Moscow State University in Moscow and the Zoological Museum in Leningrad were also examined.

Distribution: From Atlantic Ocean up to the Urals: from Sweden, Karelia in the north to northern Africa and Asia Minor in the south. We did not find it in western Siberia. Known from the southern Urals. However, we could not find it there.

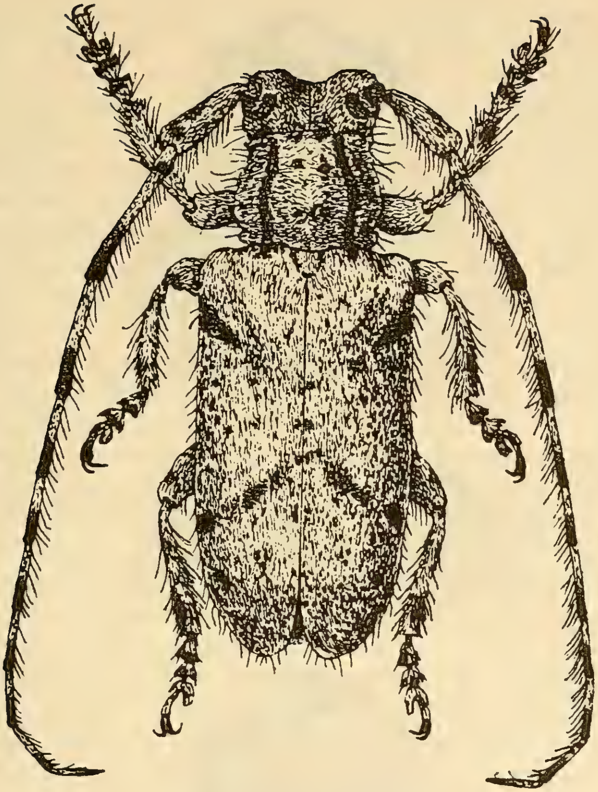
Biology: The biology of this species is described in many publications (Plavil'shchikov, 1940; Demelt, 1966; and others). Flight of beetles from May to July. Generally the females infest stems and thick knots of oak, elm, lime, and other woody plant species. Larvae live in or under bark. They make sinuous galleries up to 30 cm long and 1.0–1.5 cm wide and a pupal cell in or under bark. Beetles appear in the second half of summer and hibernate during winter. They start breeding the following summer with the onset of warmth. As per reports of Demelt (1966), generation—two- or three-year cycle.

4. **Mesosa senilis** Bat.

Bates, 1884. *Journ. Linn. Soc. Lond. Zool.*, 18: 245; Kojima and Hayashi, 1969. *Insects' Life in Japan*, 1: 93; Danilevskii and Kompantsev, 1979. *Nasekomye—razrushiteli drevesiny i ikh entomofagi*, 230–231; Krivolutskaya, 1973. *Entomofauna Kuril'skikh ostrovov*, 108.

Adult (Fig. 84): Characterized by dense gray pubescence and numerous black setigerous punctures against this background, two projecting longitudinal black bands on pronotum and two transverse black bands on elytra composed of individual transversely extended spots. Head with dense compact adherent grayish-rust pubescence, on temples and at anterior margin of frons with numerous bright projecting bristles, between eyes and antennae with deep median longitudinal groove, laterally beyond eyes with round black spot. Eyes elongate, finely faceted, with straight linear posterior margin, on inner side deeply emarginate, with very narrow septile gap between ocular lobes; upper lobe almost one-third length of lower. Antennae extending beyond apex of elytra by 7th (male) or 10th (female) segment, with minute adherent, at base of segments white, at apex black
162 hairs, on inner side with numerous long bristles. Third antennal segment distinctly longer than 4th; all segments mostly bright rust, only apically black.

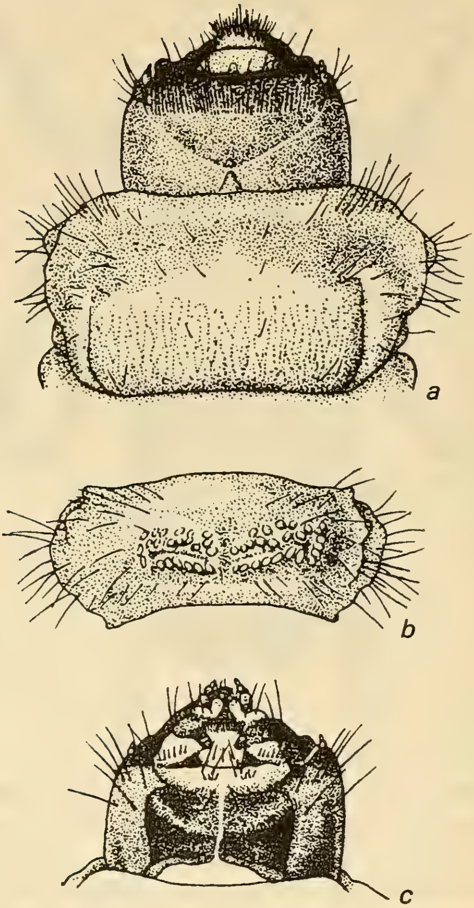
Pronotum transverse, parallel-sided or slightly rounded laterally, disk convex, with barely perceptible tubercles (of which, one pair before middle along sides of medial line and one tubercle at base on medial longitudinal line), with dense compact adherent grayish-rust pubescence, with numerous black setigerous punctures, laterally with black continuous longitudinal band (coinciding anteriorly with black spot behind upper ocular lobe), laterally with numerous bright erect hairs. Pronotal shield parallel-sided or slightly tapering posteriorly, apically broadly rounded, with dense adherent gray hairs.



161 Fig. 84. *Mesosa senilis* Bat.

Elytra parallel-sided, disk convex, apically with narrowly rounded inner angle, basally inner to humeral tubercle with small depression, with dense compact adherent grayish pubescence, with specklike black setigerous punctures and two black broken bands composed of individual, generally transversely extended spots—one band in anterior third beyond humeral tubercles, the other beyond the middle. Spots either well developed (then forming distinct bands) or faint and hence barely appearing as transverse curved row. Body ventrally with dense pubescence and semierect bright setiform
163 hairs. Legs with dense gray hairs. Forefemora and all tibiae on outer side with two black spots. Hind tarsi short, broad, their 1st segment almost not longer than 2nd. Body, legs, and elytra black, pubescence gray, somewhat rusty. Antennae variegated. Length of body 8–11 mm.

Larva (Fig. 85): Characterized by minute dense streaks on epistoma, transverse carinate convexity in posterior half of hypostoma, and other



162 Fig. 85. Larva of *Mesosa senilis* Bat.

a—head and pronotum; b—abdominal tergite with dorsal locomotory ampulla; c—head (ventral view).

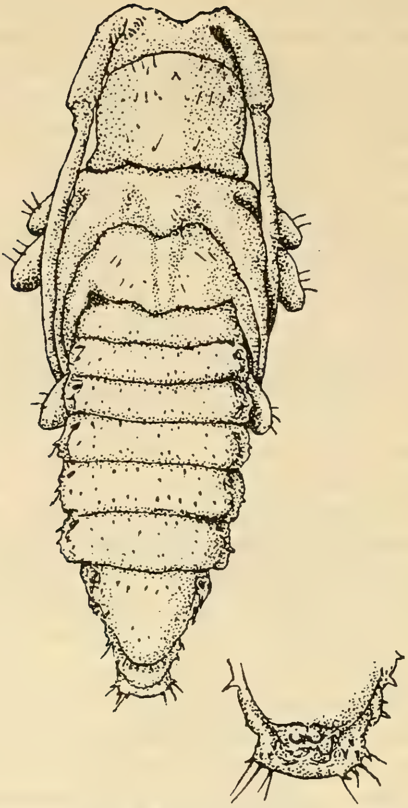
characters. Head parallel-sided, slightly retracted into prothorax. Epistoma triangular, laterally demarcated by distinct whitish frontal sutures, divided throughout length by brownish median suture, at anterior margin with narrow dark brown (almost black) fringe, in anterior half rusty, here with thin dense longitudinal streaks, in front of streaks with eight setigerous pores (four pores paramedially on each side), in posterior half yellowish. Hypostoma rusty, medially with narrow longitudinal white band, lateral to it on disk with pair of bristles in transverse row, at anterior margin insignificantly emarginate, here without brownish fringe, with narrowly rounded anterior angles, in posterior half carinately (transversely) convex. This carinate convexity extends arcuately from anterior angles of hypostoma toward its posterior half. Temporo-parietal lobes rusty, on lower side somewhat rusty-red, in anterior half with long bright solitary hairs forming one or two transverse rows. Antennae whitish, very small, barely projecting from antennal sockets. Inner to them, slightly posteriorly, lie small ampullaceous whitish ocelli. Clypeus semitransparent, lustrous, trapezoid. Labrum transverse, apically broadly rounded, in anterior half with dense rusty bristles, basally glabrous, somewhat rusty. Mandibles rusty-red, apically darker and truncate, with more elongate lower denticle on inner side, with ridge passing from lower denticle to dorsal margin.

Pronotum twice wider than long, laterally rounded, insignificantly drooping toward head, at anterior margin with whitish fringe, beyond it somewhat rusty with numerous hairs in transverse row, medially with longitudinal, barely perceptible, whitish band, in front of shield with short dispersed hairs forming transverse row. Pronotal shield slightly convex, whitish, coriaceous, laterally demarcated by short longitudinal grooves, at anterior margin transversely truncate. Prosternum barely convex, with rarefied bright rusty hairs, laterally with indistinct lustrous yellowish spot, eusternum basally glabrous, coriaceous. Meso- and metasterna with median transverse groove dividing two rows of ampullaceous granules.

Abdomen moderately elongate, laterally with sparse bright hairs. Dorsal locomotory ampullae convex, with two rows of ampullaceous granules separated by transverse groove, at posterior margin sometimes with acicular bristles in transverse row. Ventral locomotory ampullae similar. Abdominal tergite IX apically with barely perceptible, sometimes specklike, sclerotized spinule. In *Mesosa myops* (Dalm.) this spinule comparatively large, distinctly noticeable. Body length of last instar larvae 16–18 mm, width of head 2.0–2.5 mm.

Pupa (Fig. 86): Well distinguished from the pupa of *Mesosa japonica* Bat. by only one dense cluster of bristles on labrum and fewer spinules on pronotum. Head between antennae with longitudinal troughlike groove, near base of antennae with two, near anterior ocular lobes on inner side
164 two–three, laterally at anterior margin near clypeus two adjacent bristles, here medially with two wide-set bristles. Antennae on inner side annular, their apices flexed toward body between foretarsi or toward foretibiae. Labrum in anterior half with one transversely extended dense cluster of bristles, apically with individual bristles not forming cluster.

Pronotum transverse, with distinctly extended posterior angles, disk convex, with narrow median longitudinal groove and very minute setig-



162 Fig. 86. Pupa of *Mesosa senilis* Bat. (Female).

erous spinules forming three transverse rows—one at anterior margin, second medial, and the third, more rarefied (less distinct), at base. Additionally, one large spinule occurs on each side on hind clivus and two generally adjacent spinules near longitudinal groove on foreclivus of pronotum. Mesonotum posteriorly with raised, angularly produced or rounded shield, laterally with short sparse minute setigerous spinules forming two rows or two bands diverging anteriorly from apex of shield. Metanotum insignificantly convex, with median longitudinal groove, at posterior margin angularly produced, laterally with sparse, very minute spinules in two rows diverging anteriorly.

Abdomen gradually tapering toward tip, dorsally with common median longitudinal groove. Abdominal tergites convex, medially with transverse trough, at anterior and posterior margins with large acute spinules forming two transverse rows—one at anterior, the other at posterior margin. Tergite VII large, triangular, apically narrowly rounded, disk convex, with large acute setigerous spinules forming interlacing transverse row near anterior margin and extensive spinous field in posterior half. Tergite VIII short, posteriorly rounded, disk with six–eight erect projecting spinules. Tip of abdomen (ventral view) bound laterally by spinous ridge. Valvifers of female hemispherical, at base compactly contiguous. Body length 9–14 mm, width of abdomen 3–4 mm.

Material: Collected on Kunashir Island. Adults 18, larvae 75, pupae 5 males and 1 female, larval exuviae with beetles from cells 5.

Distribution: Sakhalin, Kunashir, Japan.

Biology: Found on Kunashir Island in mixed and deciduous forests. Ecologically associated with birch, poplar, and alder. Flight of beetles from May-end to July. Females lay eggs on shoots 2.0 to 6.0 cm diameter. Larvae live under the bark, make sinuous galleries longitudinal to the shoot, deeply (slitlike) impressed in wood, and fill them compactly with fine frass. Length of galleries under bark 12 cm or more, width 3–7 mm. Larvae of last instar bore into wood where, at a depth of 1–2 cm, they make a cell generally oblique to shoot surface. A layer of wood 1–2 mm thick remains between the anterior end of the cell and the bark. Sometimes the cell extends into the bark. Width of entry hole into wood 3.0 mm. Length of cell 15–22 mm, width 6–7 mm. Larvae pupate in cell with their head toward shoot surface. On standing trees, pupae lie with their head downward.

Pupation of larvae observed after hibernation in August. Pupal stage lasts about three weeks. From a larva pupated on August 10th, the beetle (male) emerged on the 28th day of this month. Another pupa developed on August 8th but the beetle that emerged from it was detected on the 31st day. The atmospheric temperature during this period fluctuated from 15°C in the morning to 29.5°C later in the day. Emergence of beetles
165 begins mid-August and is completed in September. After one week, the beetles nibble openings on the shoot surface and exit from the cell through them. They hibernate and start to reproduce the following spring. Generation—two-year cycle. Weight indices (based on 18 individuals): larvae in cell before pupation 59–114 mg (79.4 ± 3.2), pupae 55–101 mg (71.8 ± 2.7), beetles before emergence from wood 47–80 mg (58.1 ± 2.0).

Mesosa senilis Bat. infests shoots (knots) of standing trees as well as freshly felled ones. After beetle emergence from cells, the wood of shoots becomes highly infected by mold.

5. **Mesosa hirsuta** Bat.

Bates, 1884. *Journ. Linn. Soc. Lond. Zool.*, 28: 244; Breuning, 1939. *Nov. Ent.*, 9, 3: 409 (*Perimesosa*); Gressit, 1951. *Longic. Beetles of China*, 2: 414 (*Perimesosa*); Plavil'shchikov, 1958. *Fauna SSSR*, 23, pt. 1: 560–562; Kojima and Hayashi, 1969. *Insects' Life in Japan*, 1: 95; Cherepanov and Cherepanova, 1975. *Zhuki-drovoseki ivovykh lesov Sibiri*, 139–142.

Adult (Fig. 87): Characterized by dense erect hairs on elytra, pronotum, head, and ventral side of body. Head frontally flat, with median longitudinal groove, deep, not very dense punctures, and adherent gray and thin erect brownish hairs. Genae not longer than diameter of lower ocular lobes. Eyes sharply faceted, highly emarginate; interspace of ocular lobes very narrow, upper lobes barely covering base of antennae, transversely elongate. Antennae extending beyond apex of elytra (male) or barely reaching it (female), highly tapering toward apex, with minute adherent hairs, on inner side with numerous bristles.

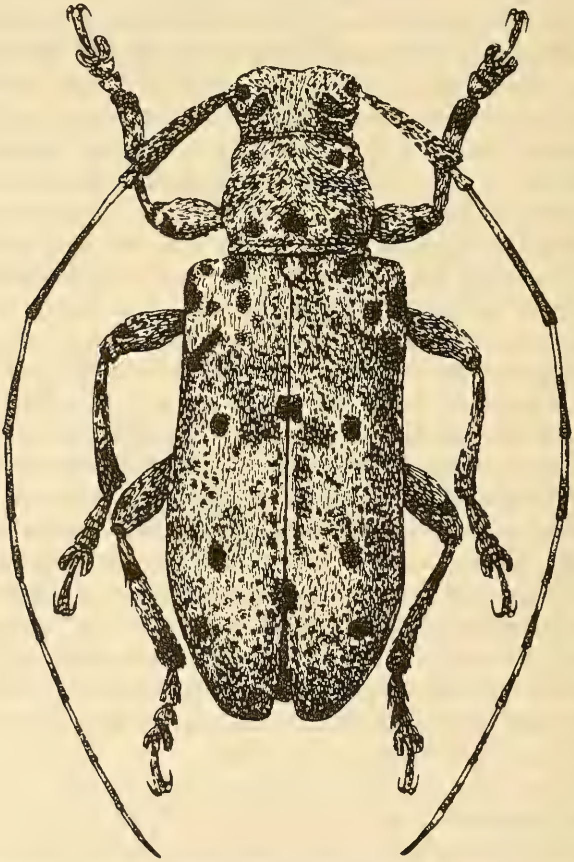


Fig. 87. *Mesosa hirsuta* Bat.

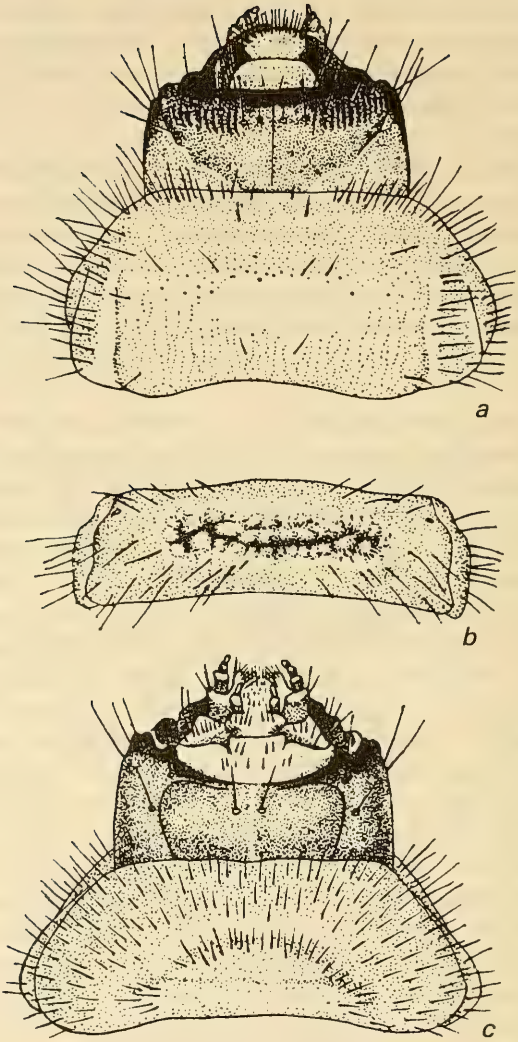
Pronotum slightly transverse, parallel-sided or laterally perceptibly rounded, in anterior fourth with barely perceptible, transverse, troughlike groove, basally with narrow curved margin, disk uniformly convex, with gray dense interlacing adherent and brownish erect hairs. Pronotal shield insignificantly elongate, posteriorly narrowly rounded, flat, with dense gray adherent hairs.

Elytra parallel-sided, sloping apically in region of outer angles, at inner angles narrowly rounded, disk convex, with insignificantly projecting humeri, with dense adherent grayish pubescence and dense brownish erect
166 hairs, basally with large deep, posteriorly fading, almost imperceptible punctation. Legs short, with dense adherent and erect brownish hairs. Body ventrally with gray adherent pubescence and semiadherent bright hairs. Abdominal sternite V thick, with gentle troughlike median longitudinal groove.

Entire body, elytra, and legs black. Antennae dark brown or black, 3rd–11th antennal segments with white pilose ringlets basally. Pronotum with five large round spots—two laterally near anterior margin and three on sides and middle near posterior margin, forming accordingly two transverse rows. Elytra with broad whitish medial transverse indistinct pilose band, indistinct whitish spot on humeri, with narrow zigzag transverse white band on hind clivus, and black round oculate spots (with white pilose fringe)—two spots at base, three–four spots on disk, two–three spots on sides, and two–three spots on humeral tubercles. Additionally, two–three tetragonal spots occur on suture. In some individuals, these spots are comparatively distinct, in others faint. Body length 8–17 mm.

Egg: White, elongate, narrowly rounded at poles. Chorion matte, without distinct cellular sculpture. Length 1.8 mm, width 0.7–0.8 mm.

Larva (Fig. 88): Similar to the larva of *Mesosa senilis* Bat. Distinguished from it by structure of hypostoma and other characters. Head
167 parallel-sided, almost half retracted into prothorax. Epistoma somewhat rusty, divided throughout length by medial longitudinal suture, laterally demarcated by distinct frontal sutures, at anterior margin smooth, with brownish fringe, behind it with eight setigerous pores in transverse row, behind them with longitudinal streaks on lateral part of sclerites (in *M. senilis* Bat. they are not only lateral, but also on inner part of sclerites). Hypostoma somewhat rusty, parallel-sided, at anterior angles gently rounded, in posterior half slightly convex (as in *M. senilis* Bat.), medially with narrow longitudinal white band, lateral to it in anterior half with pair of setigerous pores in transverse row, parietal lobes rusty, at anterior margin with narrow brownish fringe, in anterior half with long sparse setiform hairs forming two transverse rows. Antennae whitish, their apices barely extending beyond anterior margin of head capsule. Below antennae, before



166 Fig. 88. Larva of *Mesosa hirsuta* Bat.

a—head and pronotum; b—abdominal tergite with dorsal locomotory ampulla; c—head and prothorax (ventral view).

long hairs, lie unpigmented whitish ocelli; distance between ocelli and bases of antennae considerably more than diameter of ocellus per se. Clypeus large, trapezoid, semitransparent, hyaline. Labrum transversely oval, tapering toward base, in anterior half with long dense, somewhat rusty bristles.

Mandibles elongate, black, with reddish tone basally, and projecting apical denticle.

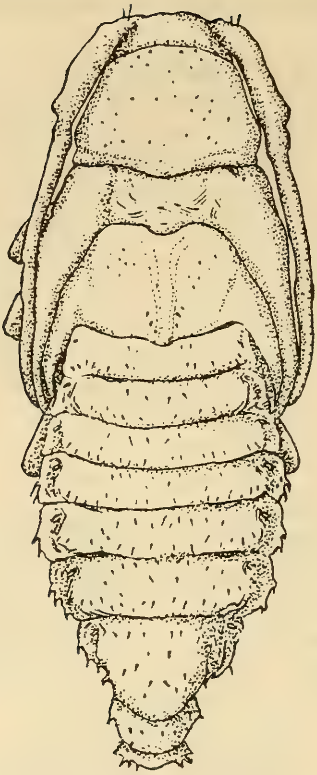
Pronotum insignificantly sloping toward head, at anterior margin with whitish fringe bearing posterolaterally bright rusty hairs in dense interlacing transverse row, behind this row with somewhat rusty-yellow transverse square divided by narrow transversely elongate white band, disk with pair of long, transversely wide-set hairs, before shield with four long hairs in transverse row, on sides glabrous, lustrous, with yellowish tone. Pronotal shield white, coriaceous, at anterior margin directly truncate, laterally with deep longitudinal folds, basally with short solitary bristles forming transverse row. Prothoracic presternum on disk convex, with long sparse hairs (in *M. senilis* Bat. hairs here markedly denser and shorter), laterally with large lustrous glabrous yellow spot. Eusternum basally glabrous. Meso- and metasterna with ampullaceous granules forming two transverse rows divided by transverse groove.

Abdomen laterally with very sparse bright hairs. Dorsal locomotory ampullae convex, with lustrous ampullaceous granules forming transversely extending cluster of three indistinct transverse rows divided medially by longitudinal groove. Ventral locomotory ampullae with ampullaceous granules in two transverse rows divided by transverse groove. Abdominal tergite IX without spinule, only with small sclerotized speck, appearing in some individuals as faint spiniform projection. Body length of late instar larvae 15–20 mm, width of head 2.2–2.5 mm.

Pupa (Fig. 89): Well distinguished from the pupa of *Mesosa senilis* Bat. by two clusters of bristles on labrum. Body stocky, thick. Head frontally with median longitudinal groove, inner to antennae with short bristles in longitudinal row. Clypeus laterally with one bristle. Labrum medially on disk with dense rusty bristles forming compact interlacing transverse row, apically with short bristles forming two small separate clusters. Antennae annular, their apices flexed toward foretarsi.

168 Pronotum slightly tapering anteriorly, near base with narrow transverse groove, with extended posterior angles, disk convex, medially with longitudinal groove, with small sparse setigerous spinules forming at anterior margin barely perceptible transverse band, medially and basally with uniform transverse row. Mesonotum transversely depressed medially, posteriorly with raised shield, with very minute spinules forming cluster extending from apex of shield toward base of elytra. Metanotum slightly convex, at posterior margin angularly produced, medially with longitudinal groove, laterally with minute dispersed setigerous spinules.

Abdomen convex, in region of segment IV enlarged, tapering insignificantly toward base, highly toward tip. Abdominal tergites with median longitudinal groove and acute setigerous spinules forming two transverse



166 Fig. 89. Pupa of *Mesosa hirsuta* Bat.

rows—one at anterior margin, second at posterior. Spinules directed backward, only at posterior margin of tergites V–VI directed forward. Tergite VII triangular, narrowly rounded posteriorly, disk convex, with large acute spinules forming uniform transverse row at anterior margin, in posterior half an interlacing transverse row. Valvifers of female hemispherical, compactly contiguous. Tip of abdomen (ventral view) obtuse, bound by U-shaped ridge set with large acute setigerous spinules. Body length 10–17 mm, width of abdomen up to 6.0 mm.

Material: Collected in the forests of Ussuri-Primor'e region. Adults 16, larvae 13, pupae 2 (male and female), larval and pupal exuviae with beetles from cells 8.

Distribution: Ussuri-Primor'e region, Korea, Japan. We found it in the forests of Gorno-taezhnaya station and in the "Kedrovaya Pad'" sanctuary.

Biology: Inhabits broad-leaved forest zones. Ecologically associated with deciduous woody plant species. Flight of sexually mature beetles in the first half of summer, Females infest the stems and knots of European bird cherry, hornbeam, elm, ash, and other deciduous plant species. Larvae live under bark, make longitudinal sinuous galleries gently impressed in wood, and fill them loosely with fine frass. Larvae of late instar bore deeply into wood, make an uneven gallery, and at the end of it a cell longitudinal to the shoot. Length of gallery under bark 7.0 cm or more, width 14–15 mm. Length of cell 15–27 mm, width 8–9 mm. Sometimes the larvae make a gallery not under bark, but in the upper layer of wood. At the anterior end of the cell they make an exit hole toward the bark. Larvae pupate with their head toward the exit.

Pupation of larvae takes place in the second half of summer (generally in August). Young beetles emerge from wood in August and early September; they leave flight openings (5 mm × 6 mm to 6 mm × 8 mm) on the bark surface. Young beetles require supplementary feeding. They hibernate and after hibernation resume supplementary feeding. During this period their gonads mature. Dissection of young beetles showed that they emerge from wood with underdeveloped gonads. Generation—two-year cycle. Initially midinstar larvae hibernate, subsequently sexually immature beetles. Based on 16 individuals, larvae before pupation weigh 104–279 mg (176.9 ± 13.8), pupae 97–254 mg (161.1 ± 12.3), beetles before emergence from wood 81–212.2 mg (130.7 ± 10.4).

Mesosa hirsuta Bat. was found by us mainly in the southeastern part of the Ussuri-Primor'e region (Khasan, ''Kedrovaya Pad',''' and Ussuriisk sanctuaries) on European bird cherry, ash, hornbeam, willow, oak and montane elm (*Ulmus laciniata*). There are reports that this beetle infests other tree species as well.

169 30. Tribe DORCASCHEMATINI

One genus with two species belongs to this tribe in the faunal composition of northern Asia. In diversity of species composition, it is closer to the fauna of southeast Asia.

1. Genus *Olenecamptus* Chevr.

Chevrolat, 1835. *Mag. Zool., Insect.*, 5: 134; *Ibidimorphum* Motschulsky, 1860. Schrenk's *Reise Amurl., Col.*, 152; Gressit, 1951. *Longic. Beetles of China*, 2: 442; Plavil'shchikov, 1958. *Fauna SSSR*, 23, pt. 1: 565–566; Cherepanov and Cherepanova, 1973. *Nov. i maloizv. vidy fauny Sibiri*, 7: 41.

Adult: Characterized by elongate body and long thin antennae extending beyond apex of elytra by 5th–7th segments. Pronotum oblong, cylindrical, at posterior and anterior angles with transverse groove. Elytra parallel-sided, elongate, disk with four white (*O. octopustulatus* (Motsch.)) or two–three black (*O. clarus* Pasc.) pilose spots.

Larva: Body whitish, elongate. Head slightly retracted into prothorax. Hypostoma basally with four longitudinal ridges (*O. octopustulatus* (Motsch.)) or without them (*O.* clarus Pasc.), weakly or highly transversely convex (*O. clarus* Pasc.).

Pupa: Recognized by location of bristles on head and spinules on dorsal side of body. Head behind antennae with spiniform bristles (*O. octopustulatus* (Motsch.)) or without them (*O. clarus* Pasc.). Pronotum at anterior margin with dense, laterally with short dispersed spinules, medially glabrous (*O. octopustulatus* (Motsch.)) or disk medially with long acicular spinules forming compact interlacing transverse row or transverse band (*O. clarus* Pasc.).

Species of the genus *Olenecamptus* Chevr. are ecologically associated with broad-leaved woody plant species. They mostly live in tropical and subtropical forest plantations and comprise a large group of fauna that flourished in the Late Tertiary period. Only two species are known in northern Asia. Maximum number of species found in southeast Asia.

Type species: *Saperda bilobus* Fabricius, 1801.

KEY TO SPECIES

Adults

1 (2). Elytra somewhat rusty, with tetragonal white pilose spots. Eastern regions of Asia . . . . 1. **O. octopustulatus** (Motsch.)

2 (1). Elytra with dense compact velvety white pubescence and round black pilose spots . . . . 2. **O. clarus** Pasc.

Larvae

1 (2). Hypostoma slightly convex, disk basally with four short sclerotized longitudinal ridges . . . . . . 1. **O. octopustulatus** (Motsch.)

2 (1). Hypostoma in posterior half transversely highly convex, disk basally without longitudinal ridges . . . . 2. **O. clarus** Pasc.

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Pupae

1 (2). Head beyond upper ocular lobes with minute acicular spinules. Pronotum on disk medially without spinules, glabrous, only at

anterior margin and laterally with short spinules. . . . . **1. O. octopustulatus** (Motsch.)

2 (1). Head beyond upper ocular lobes without spinules. Pronotum on disk medially with acicular spinules forming transverse band or compact interlacing transverse row. . . . . **2. O. clarus** Pasc.

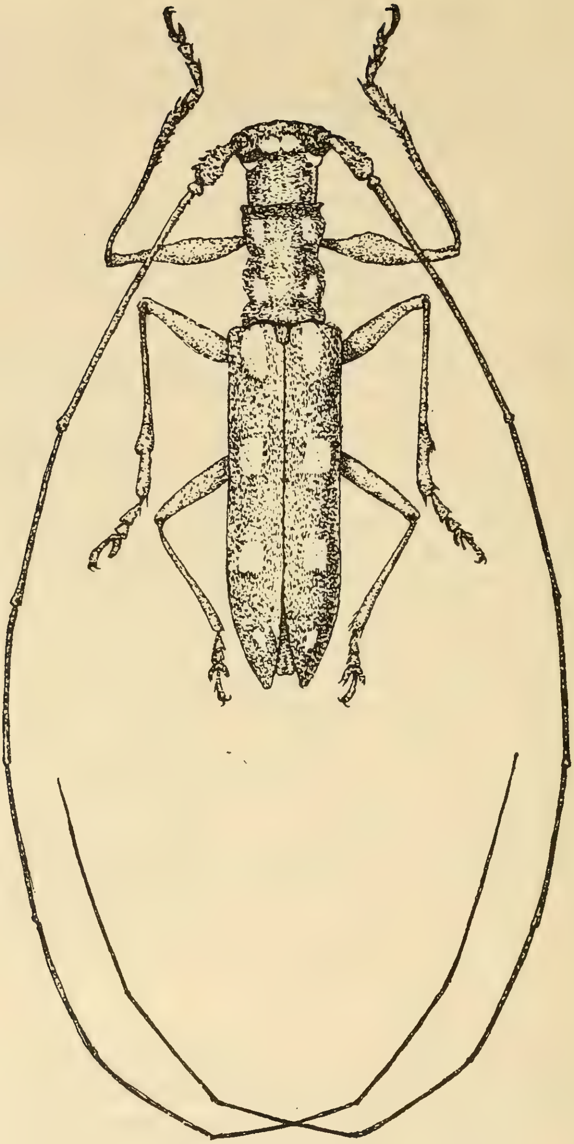
1. **Olenecamptus octopustulatus** (Motsch.)

Motschulsky, 1860. Schrenk's *Reise Amurl., Col.*, 152 (*Ibidimorphum*); Plavil'shchikov, 1958. *Fauna SSSR*, 23, pt. 1: 567–568; Kojima and Hayashi, 1969. *Insects' Life in Japan*, 1: 115; Cherepanov and Cherepanova, 1973. *Nov. i maloizv. vidy fauny Sibiri*, 7: 44–46.

Adult (Fig. 90): Readily recognized by dense white pilose spots on dorsal side. Body thin, elongate. Head barely retracted into prothorax, behind eyes parallel-sided, medially (frons, sinciput, occiput) with narrow dark brown punctate groove, with highly produced antennal tubercles, barely perceptible evanescent punctation, sparse adherent brownish hairs, and on sinciput and temples behind eyes with dense white pilose spot. Antennae long, thin, filamentous, 2.5–3.0 (male) or 1.5 (female) times longer than body, extending beyond apex of elytra by 6th segment. First antennal segment thick, short, on upper side with coarse granular sculpture; 3rd segment with sparse granular punctation; 3rd–11th segments elongate, with minute, somewhat rusty, adherent hairs. Eyes highly convex, coarsely and sharply faceted, black, well distinguished against rusty background of head, on inner upper side broadly emarginate; from above commalike ocular lobes covering antennal tubercles halfway from behind.

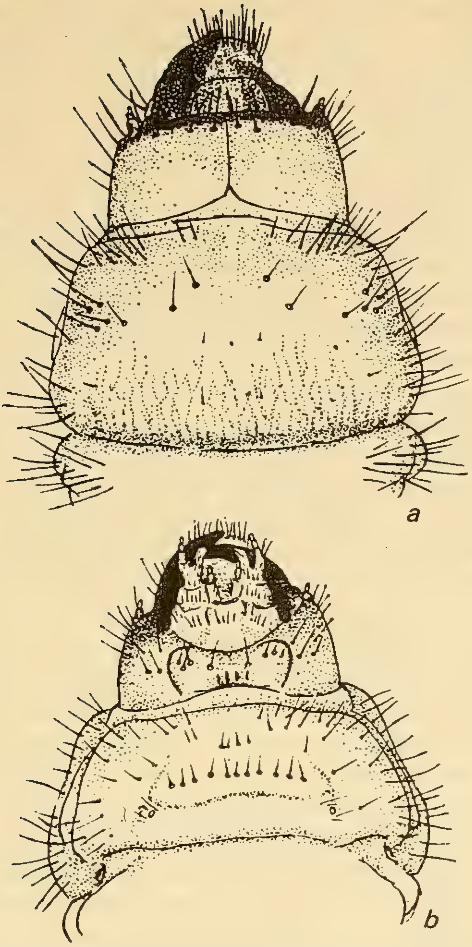
Pronotum oblong, parallel-sided, in posterior third with broad deep, in anterior third with less deep flange, disk transversely convex, with very minute, barely perceptible punctation and minute bright adherent hairs, medially with narrow longitudinal glabrous band, laterally with four dense white pilose spots—two behind anterior flange and two in region of posterior flange. Pronotal shield broadly rounded posteriorly, finely punctate, with very minute adherent hairs.

Elytra elongate, parallel-sided, with projecting smooth humeral tubercle and small perihumeral depression, apically slightly obtuse or obtusely rounded, disk and posterior third with minute vanishing, laterally with deep bold punctation, with bright, very minute adherent hairs, with four dense white pilose spots—one basally near shield, second anteromedial, third posteromedial, and fourth spot at apex. These spots are large or comparatively small, tetragonal, oval or almost round, and highly distinct against rusty background of elytra. Legs thin, hind tarsi short, half length of tibiae. Body ventrally (thorax, abdomen) with minute compact punctation and sparse adherent, somewhat rusty or grayish hairs, prosternum



171 Fig. 90. *Olenecamptus octopustulatus* (Motsch.).

laterally with narrow, meso- and metasterna as well as abdomen with much broader, dense white pilose longitudinal band. Head, antennae, pronotal shield, and elytra somewhat rusty (but occasionally rusty with brownish tinge). Body ventrally dark brown or black. Body length 9–13 mm.



172 Fig. 91. Larva of *Olenecamptus octopustulatus* (Motsch.).
a—head and pronotum; b—head and prothorax (ventral view).

Egg: White, moderately elongate, rounded at poles. Chorion smooth, without cellular sculpture. Length 0.8 mm, width 0.4 mm.

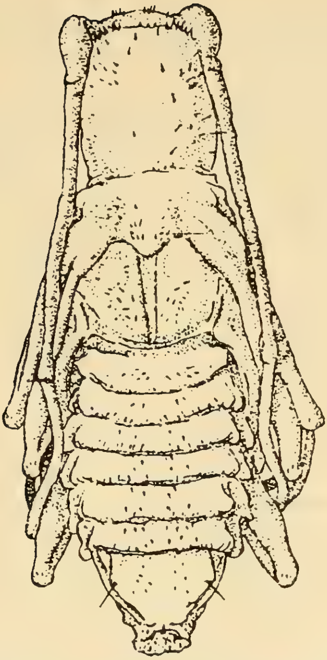
171 *Larva* (Fig. 91): Readily recognized by four longitudinal sclerotized ridges at base of hypostoma, structure of locomotory ampullae of abdomen, and combination of other characters. Body elongate, white. Head almost parallel-sided, barely tapering anteriorly, insignificantly retracted into prothorax. Epistoma insignificantly convex, bright yellowish, at anterior margin with narrow dark brown or dark rust fringe, behind it setigerous pores forming transverse row, near anterior angles with three–four groovelike

oblique streaks, laterally demarcated by barely perceptible or almost imperceptible frontal sutures. Hypostoma somewhat rusty, slightly enlarged anteriorly, with rounded anterior angles, at anterior margin and basally broadly emarginate, disk near posterior margin with four short longitudinal sclerotized ridges, lateral to them with much brighter streaks forming faint longitudinal band, before middle with four setigerous pores in transverse row (slightly recurved). Temporo-parietal lobes bright rust, at anterior margin with barely perceptible, somewhat more rusty fringe, in anterior half with long sparse bright hairs. Antennae short, their apices barely projecting beyond anterior margin of head capsule; antennal segments whitish, distally with narrow rusty-brown ringlet. Ocelli ampullaceous, whitish, away from antennae at a distance equal to diameter of ocellus per se; small black spot behind each ocellus. Clypeus large, trapezoid, hyaline, whitish or with somewhat rusty tinge. Labrum transversely oval, apically broadly rounded, markedly tapering toward base, in anterior half with dense bright rust bristles, basally with bright brownish tone. Mandibles massive, 172 on outer side toward apex roundly curved, basally red, in second half black, medially with narrow transverse groove, apically slanting.

Pronotum on disk before shield somewhat rusty, medially with narrow longitudinal white band, at anterior margin with whitish lateral square covered with long dense hairs forming transverse elongate field, before shield with individual bristles fringed basally with sclerotized ringlet. These spinules form a sparse, even or interlacing transverse row. Pronotal shield coriaceous, white, at anterior margin transversely truncate, laterally demarcated by deep longitudinal folds, with minute longitudinal bristles. Prothoracic presternum in anterior half with long setiform hairs, in posterior half laterally with slightly yellowish lustrous glabrous square. Eusternum medially with hairs in transverse row. Base of prosternum (basisternum s. sternellum) glabrous, coriaceous; meso- and metasterna with median transverse groove.

Abdomen elongate. Dorsal locomotory ampullae of abdomen convex, with more or less uniform ampullaceous granules forming two distinct transverse rows divided by transverse groove. Ventral locomotory ampullae with ampullaceous granules in two transverse rows pushed laterad in such a way that they form a distinct median interception, here with common longitudinal groove. Tergites VIII–IX with long sparse solitary hairs. Body length 14–16 mm, width of head 1.8 mm.

Pupa (Fig. 92): Body moderately elongate, slightly flat. Head short, 173 roundly tapering before antennae, between antennae with trough, here with narrow median streaklike groove passing over to sinciput and occiput, at anterior margin near clypeus with six spinules in transverse row, near base of antennae, inner to and beyond upper ocular lobes, with minute



172 Fig. 92. Pupa of *Olenecamptus octopustulatus* (Motsch.).

spinules forming one small cluster on each side. Antennae long, thin, flexed laterad, on ventral side spiraled, with five (female) to six (male) loops.

Pronotum more (male) or less (female) oblong, almost parallel-sided, near base with barely perceptible, narrow transverse groove, sufficiently convex, laterally with rarefied, unevenly dispersed, at anterior margin with much denser acute minute spinules, disk generally glabrous. Mesonotum convex, lustrous, at posterior margin with produced shield, in posterior half with small transverse depression in anterior half glabrous, in posterior half with acute spinules forming one small cluster on each side of shield. Metanotum lustrous, convex, with median longitudinal groove, at posterior margin angularly rounded, in posterior half with acute acicular spinules forming near longitudinal groove one usually oblique, anteriorly extended cluster on each side.

Abdomen in region of segments III–IV slightly enlarged, gradually or more steeply tapering toward tip. Abdominal tergites slightly convex, with barely perceptible median longitudinal groove, disk with minute acute recurved spinules forming interlacing transverse row in both posterior and (on tergites II–VI) anterior half. Spinules absent on sides of tergites. Tergite VII triangular, apically rounded, disk convex, with dispersed spinules bent mediad. Tergite VIII transversely convex, lustrous, with minute, comparatively numerous or sparse spinules (up to 12 in males, 6 in females, or spinules absent in latter). Tip of abdomen triangularly obtuse, bound laterally by ridge, on dorsal side with produced urogomphus terminating in small sclerotized spinule. Valvifers of females small, hemispherical, basally slightly wide-set, apically contiguous. Body length 9–14 mm, width of abdomen 2.5–3.0 mm.

Material: Collected in Ussuri-Primor'e region (Ussuriisk, Vladivostok, Partizansk, Khasan) and Trans-Baikal (Chikoi). Adults 457, larvae 112, pupae 2 males and 3 females, larval exuviae 6.

Distribution: Trans-Baikal (Chikoi), Ussuri-Primor'e region (Ussuriisk sanctuary, Partizansk, Lakes Khanka, Khasan, and others), southern Sakhalin, northeast China, Korean peninsula, Japan.

Biology: Inhabits deciduous plantation zones. Ecologically associated with pear (*Pyrus ussuriensis*), thornapple (*Crategus*), small apple (*Micromeles alnifolia*), apple (*Malus pallasiana*), and other woody plant species. Flight of beetles in second half of June continuing up to August. Soon after emergence from wood, beetles mate and the female lays eggs. They infest shoots 2.0–5.5 cm diameter of growing, physiologically weak, and drying trees. For oviposition the female first makes a cavity in the bark longitudinal to the stem (length of cavity 1.5 mm), then introduces its ovipositor into it, and lays an egg under the bark. A perforation is visible in the center of the cavity. The hatched larvae live initially in the bark, then under it, and there make uneven sinuous, sometimes squarish galleries longitudinal to the shoot and impressed on sapwood, and fill them with fibrous frass. Length of gallery up to 3.5 cm, width up to 1.5 cm. Larvae
174 of last instar before the second hibernation bore into wood, leaving an entry hole (1.0 mm × 2.5 mm) on the surface longitudinal to the shoot. In the wood, they make a falcate gallery upward from the entry hole, fill it with fribrous frass, and at its end make a cell. Length of cell 10–45 mm, width 4- 7 mm. Pupae lie with their head upward in the cell, directed opposite to the entry hole.

Pupation of larvae begins by May-end and is completed in the second half of June. Young beetles appear from mid-June. After a week they nibble round flight openings with uniform edges (1.8–2.5 mm in diameter) on the surface of the shoot and exit from the cell through them. Emergence of beetles from wood begins mid-June and is completed early July. Generation—two-year cycle (Table 16). Based on 28 individuals, larvae before pupation weigh 16–41.8 mg (27.6 ± 5.8), pupae 14–37 mg (24.2± 7.2), adults 10–29 mg (19.8 ± 5.8). *Olenecamptus octopustulatus* (Motsch.) mainly infests fruit trees. From the larvae collected in forests from the shoots of different woody plant species, we raised 389 beetles—253 on

Table 16. Development of *Olenecamptus octopustulatus* (Motsch.)

Year	April	May	June	July	August	September
1st	L	LP	LPA	AEL	AEL	L
2nd	L	L	L	L	L	L
3rd	L	LP	LPA	AEL	AEL	L

pear, 51 thornapple, 23 plum, 23 small apple, 20 apple, 14 cranberry, and 5 on European bird cherry.

2. **Olenecamptus clarus** Pasc.

Pascoe, 1859. *Trans. Ent. Soc. Lond.*, 2, 5: 44; Gressit, 1951. *Longic. Beetles of China*, 2: 435; Plavil'shchikov, 1958. *Fauna SSSR*, 23, pt. 1: 570–571; Kojima and Hayashi, 1969. *Insects' Life in Japan*, 1: 125; Cherepanov and Cherepanova, 1973. *Nov. i maloizv. vidy fauny Sibiri*, 7: 44–46.

Adult (Fig. 93): Well distinguished from other species by compact continuous white pubescence on dorsal side of body and large black spots on elytra. Body elongate. Head slightly broader than prothorax, with moderately produced antennal tubercles, between them with deep trough, with narrow median longitudinal groove and dense adherent white pubescence, near eyes on inner side with long bright bristles (near lower ocular lobe three, near upper lobe four–five), sinciput with small triangle, laterally beyond eyes with small streaklike spot, on lower lateral side with broad basal, sometimes on occiput with narrow black spot. Eyes sufficiently convex, sharply faceted, highly emarginate. Upper ocular lobe half size of lower, barely broader than lacertus between them. Antennae long, thin, in males 2.5 times, in females almost twice longer than body, extending beyond apex of elytra by 5th (male) or 7th (female) segment. First antennal segment apically with extended square having transverse carinate folds; 3rd–4th segments (male) or only 3rd segment (female) with granular punctation.

Pronotum oblong, parallel-sided, near anterior and posterior margins with narrow transverse groove, with dense compact adherent white hairs directed mediad and forming here a commissure in form of a longitudinal streak, with longitudinally extended black spot on disk and two round black spots in longitudinal row laterally, medially with two–five setigerous 175 pores in uniform or interlacing transverse row. Pronotal shield posteriorly broadly rounded, medially slightly depressed, with dense white pubescence.

Elytra elongate, parallel-sided, with barely projecting humeral tubercles, near these tubercles with small depression, beyond shield along suture with narrow longitudinal trough, sharply tapering toward apex, at apex obliquely truncate, with acute projecting outer angle, with very dense,

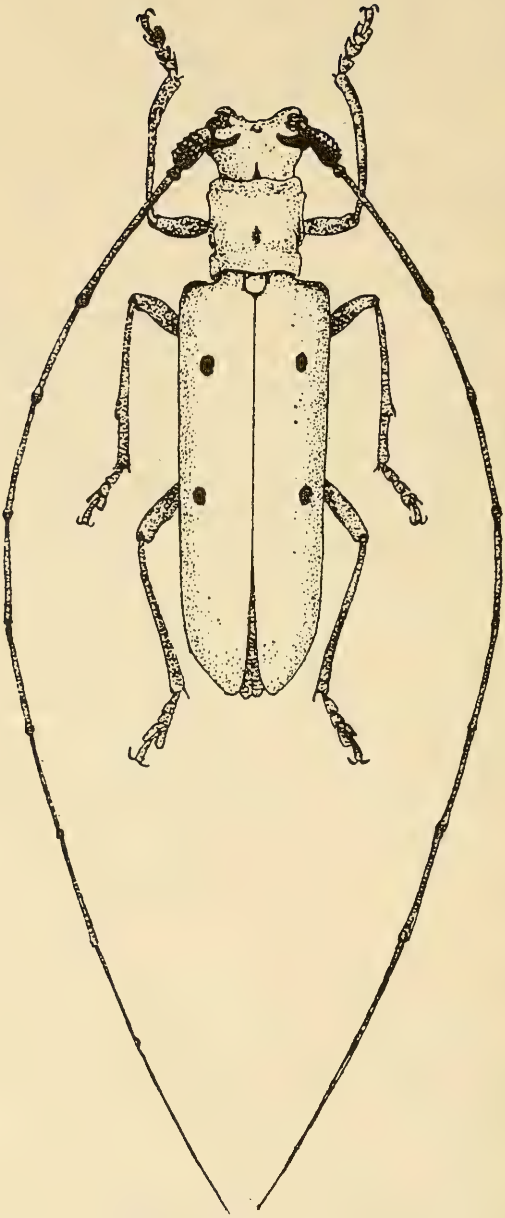
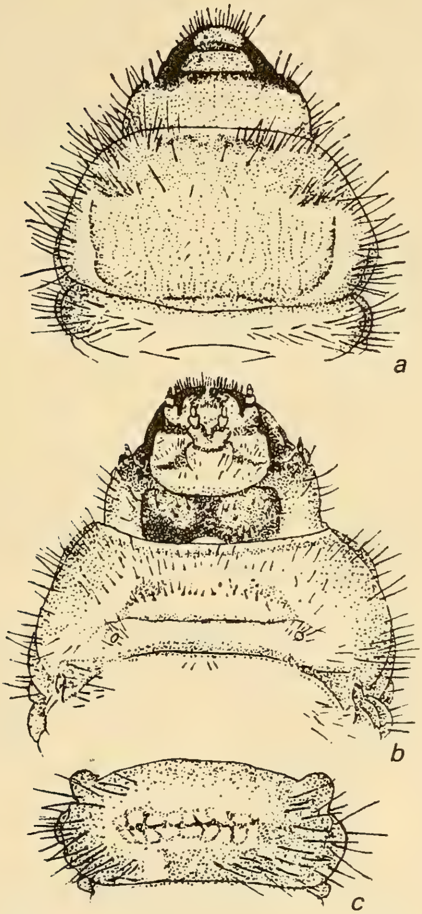


Fig. 93. *Olenecamptus clarus* Pasc.

tomentose white pubescence, on disk with three (f. typica) or more often two (ab. *subobliteratus* Pic) round black pilose spots in longitudinal row, on humeral tubercles with small longitudinal black spot. Body ventrally with not very dense, compact adherent gray pubescence, with setigerous pores forming (on abdominal sternites) transverse, often interlacing row. Body black. Legs and antennae yellow or bright rust. Body length 14–18 mm.

Larva (Fig. 94): Distinguished from the larva of *Olenecamptus octopustulatus* (Motsch.) by absence of longitudinal ridges on hypostoma and other characters. Body elongate, white. Head insignificantly retracted into



176 Fig. 94. Larva of *Olenecamptus clarus* Pasc.

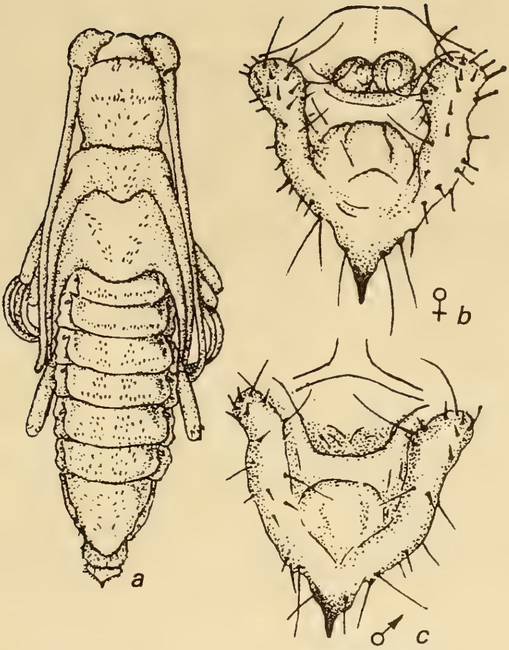
a—head and pronotum; b—head and prosternum; c—abdominal tergite with dorsal locomotory ampulla.

prothorax, barely tapering anteriorly or almost parallel-sided. Epistoma at anterior margin slightly emarginate, here with somewhat rusty-brown fringe, at anterior angles projecting, medially divided by longitudinal, slightly flaring suture, laterally not demarcated (frontal sutures not perceptible), in anterior third with four long setiform hairs in transverse row. Hypostoma reddish-rust, parallel-sided or slightly tapering toward base, at anterior angles rounded, in posterior half transversely carinately convex (this convexity extends from middle of base toward anterior angles), in anterior half with setiform hairs in uneven transverse row. Temporo-parietal lobes bright rust, at anterior margin with reddish-rust fringe, in anterior half with individual setiform long or short hairs forming uniform or interlacing transverse row. Antennae whitish, short. Ocelli barely convex, sparsely
176 pigmented. Clypeus broad, trapezoid, whitish, hyaline. Labrum transversely oval, basally highly extended, apically broadly rounded, whitish, only at base with somewhat rusty tinge, in anterior half with short bright bristles. Mandibles basally red, toward apex black, apically obliquely truncate, with elongate ventral denticle.

Pronotum tapering more anteriorly, less toward base, at anterior margin with whitish fringe, here with numerous rusty hairs forming laterally a transversely extended cluster, on disk continuous uniform transverse row, posteriorly somewhat rusty, medially with narrow longitudinal white band, before shield with short setiform hairs in uniform transverse row. Pronotal shield white, coriaceous, finely striate, at anterior margin directly truncate, anterior angles not emarginate, here demarcated by transverse groove uniting laterally with deep longitudinal fold. Prothoracic presternum laterally with long, medially with short hairs, in posterior half laterally glabrous, with somewhat rusty spot. Eusternum in anterior half with short sparse hairs, in posterior half glabrous, coriaceous. Base of prosternum (basisternum s. sternellum) lustrous, coriaceous, without perceptible sclerotization, glabrous. Thoracic legs absent, in some insects barely present as minute warts.

Abdomen elongate, laterally with thin bright hairs. Dorsal locomotory ampullae with round, comparatively ampullaceous granules in two transverse rows (8–12 granules per row) divided by transverse groove. Ventral locomotory ampullae with two rows of ampullaceous granules extending
177 dendritically mediad. Tip of abdomen with very sparse, long thin hairs. Body length 18–20 mm, width of head 2.0–2.5 mm.

Pupa (Fig. 95): Distinguished from the pupa of *Olenecamptus octopustulatus* (Motsch.) by larger size of body, dense cluster of acicular spinules in middle of pronotum, and other characters. Head on occiput uniformly rounded, beyond antennae without bristles, glabrous, between antennae with longitudinal trough, before antennae with individual dispersed acicular bristles laterally, near base of clypeus and at base of labrum with



176 Fig. 95. Pupa of *Olenecamptus clarus* Pasc.

a—dorsal view; b and c—tip of abdomen (ventral view).

acicular bristles forming respectively one transverse row on each side. Antennae long, thin, on ventral side of body, in region of hind legs, spiraled, with five (female) or six (male) loops.

Pronotum parallel-sided, more (male) or less (female) oblong, near posterior margin with narrow grooved transverse flange, with posterior angles slightly produced laterally, disk with acicular (almost setiform) spinules forming uneven, interlacing medial transverse row (or narrow transverse band), in anterior third with comparatively dense, hind clivus with sparse dispersed acicular spinules. Sides of pronotum glabrous, without spinules. Mesonotum medially slightly transversely depressed, at posterior margin with round, insignificantly produced shield, lateral to it with setiform spinules forming longitudinal band extending from posterior margin toward anterior angles of base of elytra. Metanotum slightly convex, with narrow median longitudinal groove, at posterior margin broadly rounded, with long setiform spinules forming two bands diverging from middle of posterior margin toward anterior angles.

Abdomen elongate, in region of segment IV barely enlarged, gradually tapering toward tip. Abdominal tergites toward posterior margin more convex, here with short acute (backward directed) spinules forming uniform transverse row, in anterior half slightly depressed (in any case not convex), with acute spinules forming here one small cluster (tergites II–VI) or a transverse row (tergite I). Abdominal tergite VII triangular, posteriorly rounded, basal width not more or slightly less than length, disk convex, with minute spinules forming common cluster (spinules bent forward and inward, only near anterior margin recurved). Tip of abdomen triangularly obtuse, laterally bound by high ridges bearing more (female) or less (male) dense setigerous spinules, on dorsal side with extended urogomphus terminating in minute sclerotized spinule. Valvifers of female hemispherical, bent toward each other, apically with small tubercle. Body length 14–18 mm, width of abdomen 4–5 mm.

Material: Collected in Ussuri-Primor'e region. Adults 45 (raised from the larvae collected in nature), larvae 25, pupae 2 (male and female), larval and pupal exuviae with beetles from cells 8.

Distribution: Ussuri-Primor'e region, northeast China, Korean peninsula, Japan.

Biology: Inhabits broad-leaved forests. Ecologically associated with Manchurian walnut (*Juglans manshurica*). Flight of beetles continues from June-end to mid-August. Beetles are found on growing trees of Manchurian walnut. Infest shoots 2.0–5.5 cm diameter. Larvae live under bark, make longitudinal galleries, and fill them with fibrous frass. Larvae of last instar bore into wood up to a depth of 1.2–2.0 cm, in thin shoots up to the heartwood, plug the entry hole with fibrous (coarse or fine) frass, make
178 a cell longitudinal to the shoot, and pupate with head toward the entry hole. Length of cell 23–32 mm, width 4–5 mm. Width of entry hole into wood 3.0 mm.

Pupation begins in early June and is completed by the end of this month. Developed beetles leave the pupal cell in the last days of June and in early July. They leave round flight pores up to 4.0 mm diameter on the shoot surface. Generation—two-year cycle. Based on 20 individuals, larvae before pupation weigh 51–115 mg (86.0 ± 4.5), pupae 46–110 mg (78.5 ± 4.2), young beetles soon after emergence from cells 39.5–92.5 mg (66.1 ± 3.5).

This species damages Manchurian walnut. We raised 45 beetles from the larvae collected in nature from this tree. We did not find this insect on other plant species.

31. Tribe HECYRINI

In the fauna of northern Asia, one genus with one species belongs to this tribe. Maximum number of species occurs in southeast Asia and in Africa.

1. Genus *Moechotypa* Thoms.

Thompson, 1864. *Syst. Ceramb.*, 55; *Tylophorus* Blessig, 1873, *Horae Soc. Ent. Ross.*, 9: 213; Plavil'shchikov, 1958. *Fauna SSSR*, 23, pt. 1: 572; Cherepanov and Cherepanova, 1973. *Nov. i maloizv. vidy fauny Sibiri*, 7: 49.

Adult: Body thick, stocky. Head with minute shagreen compact and bold uneven punctation. Pronotum transverse, laterally with produced tubercle, in posterior and anterior third with transverse groove, with somewhat rusty and grayish pilose spots. Elytra on disk just beyond shield with pair of black dense pilose, hummock-shaped bundles, throughout surface with uneven black tubercles.

Larva: Distinguished by the following characters. Head parallel-sided, barely tapering basally. Epistoma at anterior margin with dense longitudinal streaks reducing mediad (laterally long, medially short). Locomotory ampullae with ampullaceous, nonsclerotized granules.

Pupa: Characterized by numerous specklike setigerous obtuse spinules on pronotum and acute, backwardly directed spinules on abdominal tergites.

In northern Asia one species ecologically associated with broad-leaved forests belongs to this genus and about ten species in southeast Asia.

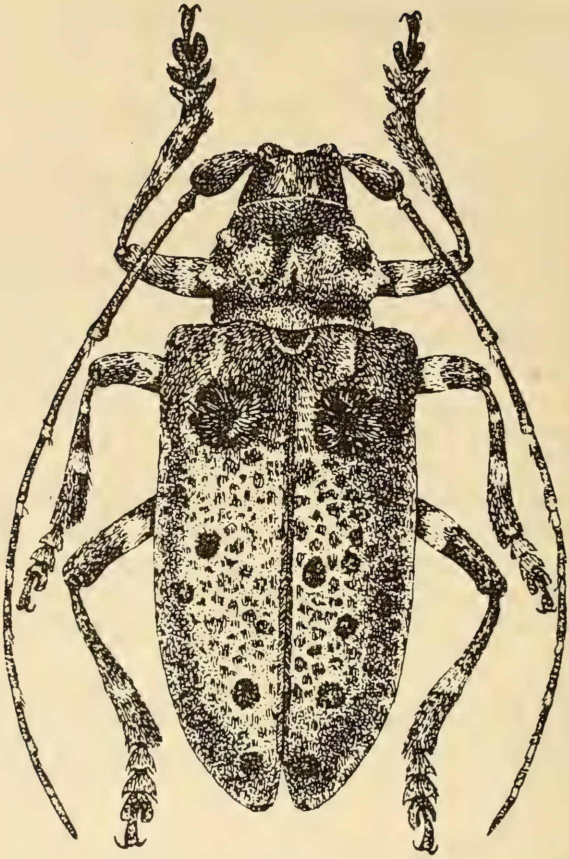
Type species: *Moechotypa arida* T., 1864 (= *Niphona suffusa* Pascoe, 1862).

1. Moechotypa diphysis (Pasc.)

Pascoe, 1871. *Ann. Mag. Nat. Hist.*, 4, 8: 277 (*Scotinauges*); — *wulfiusi* Blessig, 1873. *Horae Soc. Ent. Ross.*, 9: 215; Plavil'shchikov, 1958. *Fauna SSSR*, 23, pt. 1: 572–574; Cherepanov and Cherepanova, 1973. *Nov. i maloizv. vidy fauny Sibiri*, 7: 49–52.

Adult (Fig. 96): Readily recognized by uneven tubercular sculpture on elytra and two large black pilose bundles at their base beyond shield. Body stocky, comparatively broad. Head short, broad, with deep median longitudinal groove and wide-set, moderately elongate antennal tubercles, with very minute, compact shagreen and sparse bold uneven punctation and sparse grayish hairs. Eyes broadly emarginate, moderately convex, sharply faceted. Antennae barely longer (male) or not longer (female) than body, with minute compact punctation, short dense brownish and sparse
179 elongate semiadherent white hairs; 3rd–11th segments basally with short, somewhat rusty, pilose, contrastingly projecting ringlet.

Pronotum transverse, laterally with extended acute tubercle, disk uneven,



179 Fig. 96. *Moechotypa diphysis* (Pasc.).

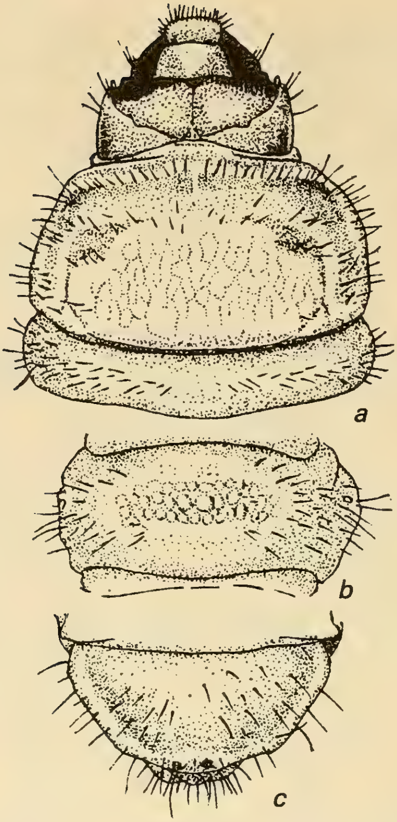
in anterior and posterior third with transverse, sometimes deep groove, medially often with longitudinal groovelike depression, lateral to it tubercularly convex medially, with minute compact shagreen, laterally with coarse uneven punctation, with dense short brownish and sparse long adherent white hairs, with dense rusty or grayish pilose spotlets. Pronotal shield broad, length less than its basal width, apically broadly rounded, with very minute compact punctation and short brownish hairs, along posterior margin with narrow rusty pilose fringe (female) or without it (male).

Elytra significantly broader than pronotum, convex, parallel-sided, steeply tapering toward apex, here jointly rounded, throughout surface with large and small black pilose tubercles separated by dense rusty or grayish, compact adherent pubescence; disk beyond shield with two large falcate, projecting bundles formed by cluster of long black hairs. Legs thick, with sparse gray hairs, femora basally and tibiae medioapically somewhat rusty or here with dense grayish pilose ringlet. All tarsi broad, their 1st–2nd segments with dense rusty or grayish hairs. Body ventrally with sparse gray or whitish hairs, on coxae and laterally abdominal sternites I–IV with dense pinkish or rusty pilose spots forming two common longitudinal rows. Sternite V laterally with small depression, apically rounded, with long black hairs forming two dense adjacent bundles (female) or laterally without depression, apically obtuse, with short black hairs forming two small wide-set bundles (male). Entire body black. Body length 15–24 mm.

Egg: White with dull silver tinge, at cranial pole, broadly, at caudal pole narrowly rounded (slightly acute). Chorion with coarse, not cellular sculpture. Length 3.2 mm, width 1.0 mm.

Larva (Fig. 97): Body thick. Head parallel-sided, less than half retracted
180 into prothorax. Epistoma somewhat rusty, laterally demarcated by barely perceptible frontal sutures, throughout length divided by medial suture, at anterior margin with dark rust fringe having dense deep longitudinal streaks laterally, gradually reducing mediad, behind fringe with short bristles forming transverse row. Hypostoma slightly convex, perceptibly tapering toward base, at anterior angles narrowly rounded, medially with white streaklike longitudinal band, lateral to it in anterior half with four–five short bristles forming small cluster on each side. Temporo-parietal lobes bright rust, at anterior margin with dark rust fringe covering ocular-antennal zone, beyond it with solitary hairs forming faint transverse row. Antennae whitish, short, concealed in antennal sockets. Ocelli convex, ampullaceous, with distance between them and antennae equal to diameter of ocellus per se. Clypeus broad, trapezoid, whitish, basally with brownish tinge. Labrum transversely oval, sharply tapering toward base, apically broadly rounded, whitish, along margins with dense, on disk with sparse short, somewhat rusty bristles. Mandibles elongate, black, basally with reddish tinge, on outer side beyond middle with thin strialike transverse streaks, apically obliquely truncate, with barely projecting dorsal denticle.

Pronotum at anterior margin with broad whitish fringe, behind it laterally with long dense hairs forming transversely extended lateral clusters between which with short solitary hairs in transverse row, on disk and laterally somewhat rusty, in middle (particularly anteriorly) with narrow longitudinal white band, before shield and laterally with short dispersed
181 hairs. Pronotal shield white, lustrous, coriaceous, with longitudinal striae, laterally demarcated by short longitudinal folds, at anterior angles emarginate, here with transverse smooth, somewhat rusty depression. Prosternum with somewhat dense rusty hairs, at base (basisternum s. sternellum) glabrous, coriaceous, without sclerotization. Meso- and metasterna with

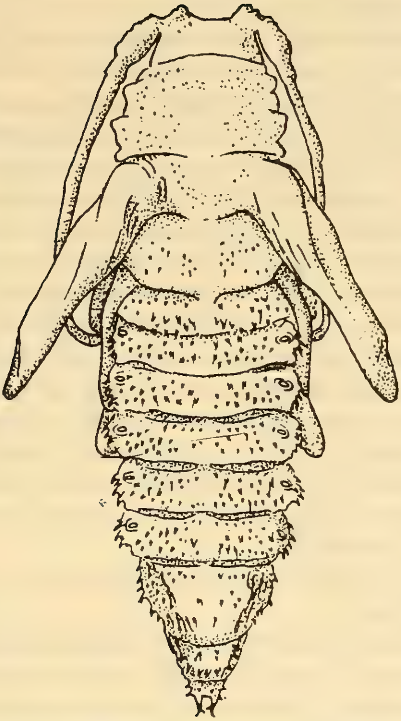


180 Fig. 97. Larva of *Moechotypa diphysis* (Pasc.).

a—head and pronotum; b—abdominal tergite with dorsal locomotory ampulla; c—abdominal tergite IX.

transverse groove, in front of this groove with short hairs forming two interlacing rows. Thoracic legs absent.

Abdomen thick, laterally with short, not very dense, rusty hairs. Dorsal locomotory ampullae with ampullaceous, lustrous, nonsclerotized granules forming three transverse rows—one inner and two outer forming outer transversely elongate ellipse. Granules of inner row distinctly larger than outer ones. Ventral locomotory ampullae with ampullaceous, nonsclerotized granules in two uniform transverse rows divided by deep groove. Abdominal tergite IX transverse, length less than its basal width, with somewhat rusty short hairs, apically with two insignificantly transversely dispersed sclerotized spinules, the distance between them almost not more than their diameter. Body length of last instar larvae 28–32 mm, width of head 4.0–4.5 mm.



180 Fig. 98. Pupa of *Moechotypa diphysis* (Pasc.).

Pupa (Fig. 98): Body moderately elongate, broad. Head between antennae with broad troughlike longitudinal groove, with insignificantly, gently produced antennal tubercles, on frons with very short dispersed bristles. Labrum on disk with acicular (curved forward) spinules forming transversely elongate dense cluster, apically with thin recurved bristles. Mandibles almost medially with thin bright bristles curved forward. Antennae short, thick, in second half arcuately flexed laterad on ventral side.

Pronotum transverse, distinctly wider than long, laterally with small, barely produced tubercle, near base with barely perceptible transverse groove, disk slightly convex, with numerous specklike obtuse setigerous spinules forming indistinct broad, anteromedial transverse band and narrow band near anterior margin. Two extensive clusters of spinules occur laterally on hind clivus. Mesonotum slightly convex, almost flat, at posterior margin broadly rounded, with minute setigerous spinules forming two bands diverging from middle toward anterior angles. Metanotum slightly convex, at posterior margin slightly produced, medially with longitudinal groove, lateral to it with minute setigerous spinules forming extensive field extending toward anterior angles.

Abdomen gradually tapering from base toward tip. Abdominal tergites slightly convex, with numerous acute setigerous spinules directed backward. Spinules form two transverse bands converging laterally into common extensive spinous field in such a way that small spinule-free interspace remains only medially on disk. Tergite VII posteriorly rounded, on disk barely convex, with acute setigerous, backwardly directed, unevenly dispersed spinules. Tergite VIII with somewhat larger unevenly dispersed spinules. Tip of abdomen (ventral view) bound laterally by projecting ridges bearing numerous large acute spinules, which together with spinules of adjoining segments form two lateral spinous bands. Posteriorly, tip of abdomen bears two falcate spinules branched terminally into two acute sclerotized appendages—inner appendage shorter than outer. Valvifers of female small, hemispherical, somewhat wide-set, apically with barely perceptible tubercle. Body length 20–25 mm, width of abdomen 5.0–5.5 mm.

182 *Material*: Collected in Ussuri-Primor'e region (Khasan, Ussuriisk sanctuary, Ovchinnikovo). Adults 103, larvae 70, pupae 1 male and 2 females, larval and pupal exuviae 4.

Distribution: Ussuri-Primor'e region, northeast China, Korean peninsula, Tsushima Islands.

Biology: Inhabits broad-leaved forests. Ecologically associated with oak. Beetles fly from May-end to July. Feed on bark of thin shoots of oak. Mating occurs after maturation of gonads and females then oviposit on stems and knots of drying and freshly felled oak trees. For this purpose, the female uses its mandibles to make an infundibular cavity in the bark and through it lays an egg under the bark. Generally, one egg is laid in each cavity. Oviposition is mostly completed toward mid-July. Density of infestation is very high. For example, on July 15, 1972, in the forests of Chernigovsk region (near Ussuriisk), up to 53 cavities were found on the stems of undergrowth (5–7 cm diameter) per running meter; in another instance, up to 528. Larvae hatch two weeks after oviposition. Thus, from eggs laid by females on June 24th, larvae hatched on July 8th, and from eggs laid June 27th, larvae began to hatch from July 9th.

Larvae live under bark, make galleries longitudinal to the stem, and fill them with fine fibrous frass. Galleries uneven, sinuous, sometimes becoming squarish, and occupy almost the entire circumference of the shoot. Length of gallery 15 cm or more, width 1.3 cm. Larvae of last instar make cell under bark impressed in the upper layer of wood and pupate in it. Length of pupal cell 3.6 cm, width 1.3 cm. Pupae develop in about three weeks. In the laboratory at room temperature, from a pupa formed on March 1st, the beetle emerged on the 24th day of this month.

In nature, pupation of larvae begins July-end and is completed in the second half of August. Young beetles appear in August and early September. They remain in the cells for five–seven days, then nibble flight openings (8 mm × 6 mm) on the bark surface, and exit the cells through them. They fly to the nearest trees, feed on the bark of thin shoots, and subsequently hibernate. Generation—two-year cycle. Based on 11 individuals, larvae before pupation weigh 174.5–647.6 mg (434.6 ± 45.2), pupae 150.4–588.2 mg (365.5 ± 37.1), beetles before emergence from cells 130–515 mg (307.6 ± 34.1). Under laboratory conditions, a larva before pupation weighed 466.5 mg (100%), the pupa formed from it 373.4 mg (80%), and the beetle 280 mg (60%). The weight of the insect during metamorphosis reduced by 40%.

Moechotypa diphysis (Pasc.) damages only oak. From the larvae collected in the forest from the shoots of oak, we raised 72 beetles. This insect was not found on other plant species. It infests shoots 2.2–7.0 cm or more in diameter and damages the stems of mature and maturing trees. *Mesosa myops* (Dalm.) is often found together with this species.

32. Tribe PTEROPLIINI

Adults: Distinguished from representatives of other tribes by broad head and wide-set antennal tubercles. First antennal segment elongate, apically rounded, without cicatrix. Pronotum parallel-sided, laterally without produced tubercle.

Larvae: Characterized by head half or less retracted into prothorax, epistoma at anterior margin with lateral longitudinal streaks (*Pterolophia ussuriensis* Plav., *P. maacki* (Bless.)) or without them (*Pterolophia jugosa* Bat., *Egesina bifasciana* (Matsush.)). Shield of pronotum white, coriaceous. Dorsal and ventral locomotory ampullae with ampullaceous granules forming two transverse rows. Abdominal tergite IX with apical spinule (*Egesina* Pasc.) or without it (*Pterolophia* New.). 183

Pupae: Head broad, with wide-set, insignificantly produced antennal tubercles. Antennae flexed laterad, at level of abdominal sternite IV bent ventrad, here behind hind tarsi inclining apically toward body (*Pterolophia* New.) or behind midfemora bent forward looplike, with apices inclining toward foretibiae or toward sides of head (*Egesina* Pasc.). Pronotum parallel-sided, laterally without produced tubercle. Abdomen obtuse at tip, with square demarcated by semicircular (*Egesina bifasciana* (Matsush.), *Pterolophia ussuriensis* Plav.) or tetragonal (*Pterolophia jugosa* Bat.) ridge bearing acute setigerous spinules, without urogomphus.

In the fauna of northern Asia, two genera belong to this tribe, of which *Pterolophia* New. is the richest in species composition and in specific diversity comes closer to the fauna of southeast Asia and Japan.

KEY TO GENERA

Adults

1 (2). Elytra with adherent hairs, without erect or projecting hairs . . . . **1. Pterolophia** New.

2 (1). Elytra with adherent and throughout surface with erect or projecting setiform hairs . . . . **2. Egesina** Pasc.

Larvae

1 (2). Abdominal tergite IX apically without spinule or with spinule (see Fig. 105) . . . . **1. Pterolophia** New.

2 (1). Abdominal tergite IX apically with acute sclerotized spinule . . . . **2. Egesina** Pasc.

Pupae

1 (2). Antennae bent ventrad at level of abdominal sternite IV, not extending far forward by apex. . . . . **1. Pterolophia** New.

2 (1). Antennae bent ventrad directly beyond midfemora, here directed forward, their apices inclining toward foretibiae or toward sides of head. . . . . **2. Egesina** Pasc.

1. Genus *Pterolophia* New.

Newman, 1842. *Entomologist*, 1: 370; — *Prioneta* Blanchard, 1853. *Voy. Pole Sud. Zool.*, 5: 66 (type: *P. albosignata* Blanch.); — *Praonetha* Pascoe, 1862. *Yll. Entom.*, 1: 348; — *Eurycotyle* Blessig, 1873. *Hor. Soc. Ent. Ross.*, 9: 210 (type: *E. maacki* Blessig); Gressit, 1951. *Longic. Beetles of China*, 2: 459.

Adult: Characterized by small body. Head with wide-set, slightly (*P. jugosa* Bat.) or fully produced (*P. ussuriensis* Plav.) antennal tubercles, with median longitudinal groove passing over from frons to posterior margin of occiput. Antennae shorter than body, extending up to hind clivus of elytra or almost up to elytral apex. Pronotum parallel-sided, laterally not produced tubercularly. Elytra parallel-sided (*P. ussuriensis* Plav.) or beyond middle slightly enlarged, hind clivus steeply tapering, disk beyond shield 184 with pair of more (*P. ussuriensis* Plav.) or less (*P. jugosa* Bat.) distinct tubercles. Midtibiae on outer side with barely perceptible distal notch (*P. ussuriensis* Plav.) or without it.

Larva: Body white, moderately elongate. Head half retracted into prothorax, laterally with ampullaceous ocellus on each side. Pronotum before shield with dense (*P. ussuriensis* Plav.) or sparse (*P. maacki* (Bless.)) hairs. Pronotal shield white, coriaceous. Dorsal and ventral locomotory ampullae well developed on segments I–VII of abdomen, with ampullaceous, lustrous, nonsclerotized granules forming two transverse rows divided by transverse groove. Abdominal tergite IX apically rounded, without spinule.

Pupa: Distinguished by structure of antennae, location of spinules on abdominal tergites, absence of urogomphus, and other characters. Head broad, laterally before antennae with long solitary bristles. Antennae flexed laterad, their apices bent ventrad, here inclining toward each other and forming common longitudinal ellipse. Pronotum laterally without produced tubercle. Abdomen moderately elongate, at tip obtuse, here with U-shaped or semicircular ridge, without urogomphus. Abdominal tergites with acute, backwardly directed spinules forming at posterior margin transverse row or narrow transverse band, at anterior margin, sometimes medially one transverse row.

In northern Asia, three species belong to the genus *Pterolophia* New. While about 50 species are known in southeast Asia and 16 species have been found in Japan.

Type species: *Pterolophia biggibera* Newman, 1842.

KEY TO SPECIES

Adults

1 (4). Elytra in anterior half without broad transverse whitish band.

2 (3). Elytra elongate, parallel-sided, beyond middle with narrow white pilose band not enlarging toward sides. Ussuri-Primor'e region, Trans-Baikal . . . . 1. **P. ussuriensis** Plav.

3 (2). Elytra not very elongate, slightly enlarging posterior to base, beyond middle with broad white pilose band, highly enlarging toward sides and tapering cuneiformly toward suture. Ussuri-Primor'e region, northeast China, Korean peninsula. . . . . 2. **P. maacki** (Bless.)

4 (1). Elytra in anterior half with broad transverse whitish band. Kunashir, islands of Japan. . . . . 3. **P. jugosa** Bat.

Larvae

1 (4). Anterior margin of epistoma laterally with short longitudinal streaks.

2 (3). Pronotum on disk before shield with broad pilose field. On oak, elm, and other deciduous plant species. . . . . 1. **P. ussuriensis** Plav.

3 (2). Pronotum on disk before shield without pilose field, generally with five pairs of setiform hairs distinctly located in tandem. On mulberry . . . . 2. **P. maacki** (Bless.)

4 (1). Anterior margin of epistoma laterally glabrous, without longitudinal streaks. On elm, mulberry, and other deciduous plant species. . . . . 3. **P. jugosa** Bat.

185 **Pupae**

1 (2). Antennae with apices bent ventrad behind hind tarsi, here touching each other and forming longitudinal ellipse. . . . . 1. **P. ussuriensis** Plav.

2 (1). Antennae with apices bent falcate on ventral side before hind tarsi, not touching each other . . . . 3. **P. jugosa** Bat.

1. **Pterolophia ussuriensis** Plav.

Plavilstshikov [Plavil'shchikov], 1954. *Zool. Zhurn.*, 33, 2: 473–474; Cherepanov and Cherepanova, 1974. *Nov. i maloizv. vidy fauny Sibiri*, 8: 36–39; — *selengensis* Ljamzeva, 1979. *Tr. vses. entomol. obshchestva*, 61: 79–82.

Adult (Fig. 99): Body moderately elongate. Head with median longitudinal groove passing over to occiput from frons, wide-set antennal tubercles produced laterally, deep punctation, and adjacent gray hairs. Eyes broadly and highly emarginate, sharply faceted; upper ocular lobe half size of lower. Antennae reaching (male) or not reaching (female) apex of elytra, with sparse compact adherent hairs; 5th–11th segments basally with short, sometimes barely perceptible, whitish pilose ringlets. First antennal segment shorter than 3rd, but longer than 4th or equal to it.

Pronotum not longer or barely longer than wide, basally at posterior margin with narrow sharp, at anterior margin with gentle faint transverse groove, disk uniformly convex, laterally barely rounded, with compact punctation and adherent yellowish hairs. Pronotal shield flat, insignificantly tapering posteriorly, apically broadly rounded, with dense compact adherent yellowish hairs. Elytra parallel-sided, tapering in posterior fourth, apically jointly narrowly rounded, disk convex, basally beyond shield with two distinct tubercles, laterally with one–two barely perceptible longitudinal ridges, near suture with coarse deep, laterally and on hind clivus with minute punctation, throughout surface with yellowish hairs forming uneven spotty background, beyond middle with white lateral hairs forming

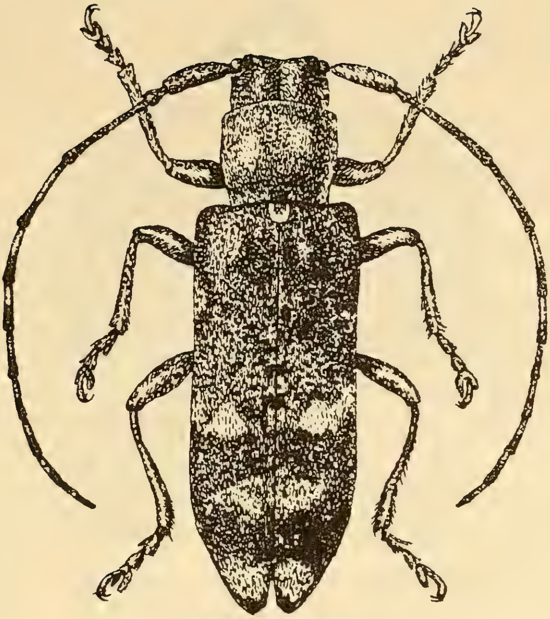


Fig. 99. *Pterolophia ussuriensis* Plav.

transverse pilose, distinct or indistinct band. Legs with adherent grayish-yellow hairs and erect bright bristles. Hind tarsi not shorter than tibiae. Body ventrally with gray adherent pubescence. Abdominal sternite V apically more (male) or less (female) emarginate. Parameres of male genitalia parallel-sided, apically broadly rounded, here with long brownish bristles
186 forming dense bundle. Phallus sharply tapering toward apex, terminally acute, brownish. Body, antennae, and legs black. Body length 6–9 mm.

Egg: White, elongate, almost uniformly broadly rounded at poles. Chorion smooth, lustrous, without perceptible sculpture. Length 1.8 mm, width 0.4 mm.

Larva (Fig. 100): Characterized by thin dense longitudinal streaks at anterior margin of epistoma. Body white, small, slightly elongate. Head almost parallel-sided, barely tapering in anterior half. Epistoma slightly convex, throughout length divided by medial longitudinal suture, laterally fusing with temporo-parietal lobes, at anterior margin with rusty-brown fringe having thin dense longitudinal streaks laterally, between streaks smooth, gently (insignificantly) sinuous, behind fringe with long bright setiform hairs in transverse row. Hypostoma slightly convex, at anterior angles rounded, somewhat rusty, medially with narrow white longitudinal

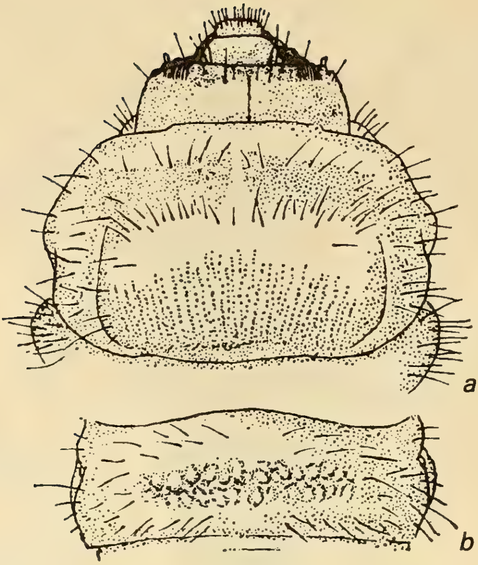


Fig. 100. Larva of *Pterolophia ussuriensis* Plav.

a—head and pronotum; b—abdominal tergite with dorsal locomotory ampulla.

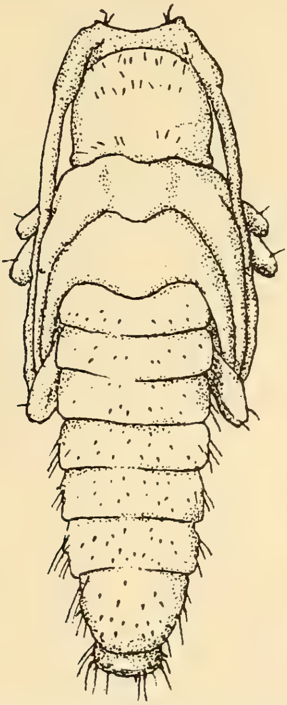
band, before middle with pair of long paramedial bristles. Temporo-parietal lobes at anterior margin with broad lustrous fringe barely covering ocular-antennal zone, beyond fringe with individual setiform hairs in transverse row. Antennae very short, whitish. Ocelli ampullaceous, below antennae, with pigmented spotlet. Clypeus large, whitish, trapezoid. Labrum transverse, anteriorly gently rounded, basally somewhat rusty, with dense, somewhat rusty bristles. Mandibles reddish-brown, only apically black, here gently sloping, with acute ventral denticle.

Pronotum tapering anteriorly, at anterior margin rounded, here with whitish fringe, behind it somewhat rusty, before shield, laterally, and in anterior third with long, somewhat rusty hairs forming extensive pilose field, only on disk with small glabrous field. Pronotal shield white, cori-
187 aceous, with longitudinal streaklike striae, at anterior margin rounded, laterally demarcated by short longitudinal folds. Prosternum uniformly convex, with uniform, comparatively dense rusty hairs, laterally with yellowish glabrous lustrous spot, at base (basisternum s. sternellum) glabrous, coriaceous.

Abdomen laterally with short, very thin, bright erect hairs. Abdominal tergites uniformly convex. Dorsal locomotory ampullae with minute ampullaceous, lustrous granules forming two transverse rows, often slightly recurved. Ventral locomotory ampullae similar, except that ampullaceous granules form two straight parallel rows, not bent backward. Tip of abdomen with long, somewhat rusty hairs. Body length of late instar larvae 10–13 mm, width of head up to 1.5 mm.

Pupa (Fig. 101): Distinguished from the pupa of *Pterolophia jugosa* Bat. by antennae flexed laterad, their apices bent toward ventral side of abdomen behind hind tarsi, not bent forward. Head short, frontally flat, with indistinct antennal tubercles, near them on inner side with two–three very short, before eyes with three long rusty bristles, at anterior margin near clypeus with six short bristles forming transverse row. Labrum convex, disk with dense rusty bristles forming transverse band, apically with individual bristles (female) or without them (male). Antennae thin, flexed laterad, their apices bent toward ventral side of abdomen behind hind tarsi, often here with last segments touching each other, forming as it were, a common elongate ellipse, more prominent in males.

Pronotum square or slightly transverse, parallel-sided, in anterior half more convex, in posterior half slightly flat, with thin bright rust bristles



186 Fig. 101. Pupa of *Pterolophia ussuriensis* Plav.

forming two distinct dense transverse bands—one at anterior margin, the other medially. Bristles with sclerotized, sometimes spinous base. Base of pronotum with bristles or without them. Mesonotum barely convex, posteriorly with triangularly produced shield, laterally with barely perceptible bright bristles forming rarefied cluster. Metanotum at posterior margin slightly produced triangularly, medially with barely perceptible longitudinal groove, laterally with individual dispersed bristles.

Abdomen tapering in posterior half. Abdominal tergites insignificantly convex, with acute dispersed spinules forming one row at posterior, another at anterior margin. Spinules backwardly directed, in some individuals on tergites V and VI spinules of posterior row bent forward. Tergite VII posteriorly rounded, disk convex, with large setigerous spinules projecting upward or bent forward at posterior margin. Tergite VIII convex, hyaline, medially with minute acute spinules forming transverse row. Tip of abdomen obtuse, bound by semicircular ridge bearing up to 12 short acute spinules. Valvifers of female hemispherical, compactly contiguous. Body length 7–12 mm, width of abdomen 2–3 mm.

Material: Collected in Ussuri-Primor'e region (Komarovka River, Barabash, Khasan, southern Sikhote-Alin). Adults 591, larvae 72, pupae 4 males and 4 females, larval and pupal exuviae with beetles from cells 24.

Distribution: Trans-Baikal and the Far East, from the Selenga River to coasts of the seas of Okhotsk and Japan, from spurs of Sikhote-Alin in the north to Lakes Khasan and Khanka in the south.

Biology: Inhabits broad-leaved forest plantations. Ecologically asso-
188 ciated with oak, elm, ash, and other woody plant species. Emergence of young beetles from wood begins June-end and is completed in the last ten days of August. According to our observations, in the Ussuriisk sanctuary during 1971–1972, of every 100 beetles, 2 emerged in the second half of June, 63 in the first half of July, 18 in the second half, and 17 in August. Beetles are found up to the middle of the first ten days of September. They lead a cryptic mode of life, do not appear on flowers, and after emergence from wood generally fly to shoots of woody plant species. There they feed on the bark of shoots, mate, and the females then oviposit in cracks in the bark of thin shoots 0.6–3.5 cm diameter. Under natural conditions, larvae hatch from eggs three weeks after oviposition. Hatching larvae break the chorion, bore into bark, make galleries under it longitudinal to the shoot, and fill them with fine frass. Galleries are faintly or sharply impressed on sapwood. Before the second hibernation, larvae bore into wood, there in the upper layer (in thin shoots, in the heartwood) make longitudinal, sometimes sinuous galleries, and fill them with loose frass. At end of gallery (after the second hibernation), they make a cell longitudinal to the shoot or oblique to the shoot surface

Table 17. Development of *Pterolophia ussuriensis* Plav.

Year	May	June	July	August	September
1st	L	LPA	PAE	AEL	L
2nd	L	L	L	L	L
3rd	L	LPA	PAE	AEL	L

in such a way that the anterior end penetrates the bark. Larvae pupate with their head upward, toward the anterior end of the cell. Length of gallery in wood up to 7.0 cm, width 4–5 mm; length of pupal cell 11–13 mm, width 4–5 mm.

Pupation of larvae begins in June and is completed toward mid-August. Pupa develops in 14–22 days, on average, 17.4 days (11 pupae kept under observation). Young beetles remain in the cell for about one week, then nibble oval flight openings (2.0 mm × 2.5 mm to 3.5 mm × 4.0 mm) on the shoot surface and exit from the cell through them. Beetles emerge from wood with underdeveloped gonads and require supplementary feeding. Based on 56 insects, larvae before pupation weigh 8.0–40.0 mg (23.1 ± 1.2), pupae 7–36 mg (20.6 ± 1.1), young beetles before emergence from wood 6.0–32.0 mg (17.0 ± 0.9). Generation—two-year cycle (Table 17).

Pterolophia ussuriensis Plav. infests the shoots of drying as well as viable trees of different woody species. From the larvae collected by us in nature, 465 beetles were raised—249 on shoots of oak, 59 elm, 48 ash, 32 acanthus, 31 lespedeza, 29 birch, 4 maple, 4 mulberry, 4 lime tree bast, 2 beam tree, 2 spindle tree, and 1 on apricot. Density of infestation is indicated by this example: in a shoot 21 cm long and 1.5 cm diameter, four beetles were found in cells. Also, during forest inspections, 103 specimens (larvae, pupae, beetles) were collected—42 from oak, 31 elm, 10 birch, 8 lespedeza, 7 ash, 4 acanthus and 1 from cranberry. Apparently, this species mainly develops on the shoots of oak and elm.

Taxonomic notes: An examination of a large series of *Pterolophia ussuriensis* Plav. beetles and their comparison with type specimens of *P. selengensis* Ljamc. preserved in the Zoological Institute, Academy of Scienes USSR (Leningrad) enables us to conclude that these two species
189 are identical in morphological characters. In fact, it is impossible to differentiate them. The differences mentioned in the description (Lyamtseva, 1979) are within the limits of individual variability. Ecologically (as per occupied niches), they are homogeneous. They develop on thin shoots of deciduous woody plant species, often including elm (*Ulmus*).

2. **Pterolophia maacki** (Bless.)

Blessig, 1873. *Horae Soc. Ent. Ross.*, 9: 211 (*Eurycotyle*); Ganglbauer, 1884. *Bet.-Tab.*, 8: 102 (536) (*Eurycotyle*); Yakobson, 1911. *Zhuki Rossii*, tab. 71. fig. 26 (*Eurycotyle*); Plavil'shchikov, 1932. *Zhuki-drovoseki vred. drevesiny*, 294 (*E. maacki* Bless.); Cherepanov and Cherepanova, 1974. *Nov. i maloizv. vidy fauny Sibiri*, 8: 39–40; Gressit, 1951. *Longic. Beetles of China*, 2: 470 (+ *P. mandshurica* Br.).

Adult (Fig. 102): Characterized by comparatively short body and broad transverse white band on elytra. Body short. Head medially between antennae with deep longitudinal groove, with minute vanishing punctation, and dense or slightly rarefied grayish-yellow adherent hairs. Eyes broadly emarginate; upper ocular lobe half size of lower (anterior) lobe. Antennae shorter than body, barely reaching hind clivus of elytra (female) or extending slightly beyond it (male), with minute punctation and short adherent hairs forming whitish ringlet at base of each segment. First antennal segment 1.5 times shorter than 3rd, equal to 4th.

Pronotum slightly transverse or square, at base with narrow grooved transverse flange, at anterior margin with less distinct transverse groove, disk uniformly convex, with compact minute punctation and short adherent yellowish or golden-gray hairs. Pronotal shield flat, posteriorly broadly or narrowly rounded, with minute punctation and dense grayish-yellow hairs.

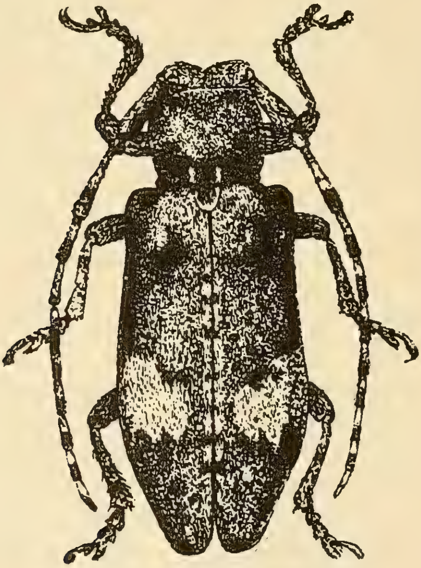
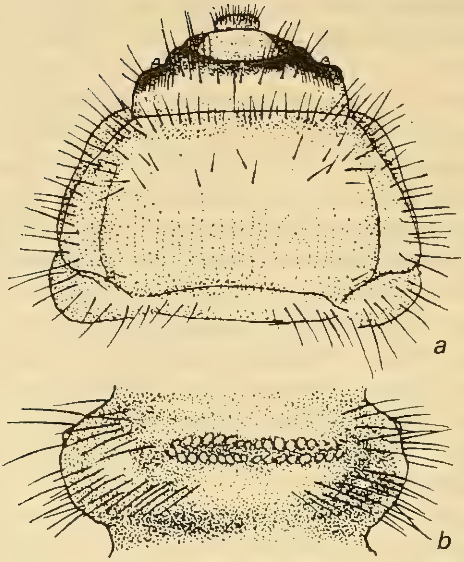


Fig. 102. *Pterolophia maacki* (Bless.).

Elytra slightly elongate, parallel-sided or beyond humeri slightly depressed from sides, from here slightly enlarging posteriorly, apically slightly obtuse or rounded, on disk basally, behind shield, with two tubercles along sides of suture, with longitudinal ridges—one before hind clivus, the other lateral to humeral tubercle toward apex of elytra; with 190 somewhat coarse (near suture) or vanishing (near lateral margin) punctation and brownish-yellow, not very dense hairs, beyond middle with broad white dense lateral pilose band tapering at inner and enlarging at outer margin, with black specks along suture. Body ventrally with dense even adherent grayish pubescence. Abdominal sternite V apically rounded or slightly obtuse. Legs not long, comparatively thick, with dense adherent gray hairs. Hind femora with apex extending only beyond posterior margin of white band on elytra. Hind tarsi slightly shorter than tibiae. Body black. Legs and stomatic apparatus somewhat rusty. Antennae dark brown, segments basally somewhat rusty. Pronotum at anterior and posterior margins with rusty fringe. Elytra dark brown, in some individuals with somewhat rusty tinge. Body length 4.5–6.5 mm.

Larva (Fig. 103): In longitudinal streaks at anterior margin of epistoma, close to the larva of *Pterolophia ussuriensis* Plav. Distinguished from it by much sparser hairs on pronotal shield and on abdominal segment IX. Head parallel-sided, half retracted into prothorax. Epistoma somewhat rusty, poorly convex, medially divided by sharp longitudinal suture, laterally fusing with temporo-parietal lobes, at anterior margin with rusty-brown fringe having minute thin longitudinal streaks laterally, behind fringe with solitary setiform hairs forming transverse row. Hypostoma parallel-sided, barely convex or almost flat, somewhat rusty, medially with white longitudinal band, in anterior half with pair of paramedial bristles. Temporo-parietal lobes bright rusty, at anterior margin with somewhat rusty-brown fringe covering ocular-antennal zone, behind it with bright solitary hairs in transverse row. Antennae whitish, barely projecting from antennal sockets. Ocelli ampullaceous, whitish, with pigmented black spotlet laterally. Clypeus hyaline, semitransparent, trapezoid. Labrum whitish, transversely oval, in anterior half with dense bright bristles.

Pronotum distinctly tapering anteriorly, at anterior margin gently rounded, here with whitish fringe, at posterior margin with long hairs forming compact interlacing row, disk and laterally somewhat rusty, before shield with not very long paired hairs not forming an extensive pilose field. Pronotal shield convex, white, not sclerotized, at anterior margin broadly rounded, medially sometimes slightly produced, laterally demarcated by short longitudinal folds. Prosternum in anterior half and laterally with somewhat rusty, not very dense hairs, at base (basisternum) and on eusternum glabrous, without hairs.



189 Fig. 103. Larva of *Pterolophia maacki* (Bless.).

a—head and pronotum; b—abdominal tergite with dorsal locomotory ampulla.

Abdomen laterally with very thin, erect, projecting bright rust hairs. Dorsal locomotory ampullae with minute ampullaceous granules forming two transverse, at places interlacing (uneven) rows divided by narrow transverse groove. Ventral locomotory ampullae similar. Abdominal tergite IX barely longer than basal width, disk convex, lustrous, apically broadly rounded, in posterior half laterally with long sparse bright rusty hairs, along medial line glabrous. Sternite IX at posterior margin transversely truncate, near it with long hairs forming interlacing transverse row or narrow transverse band, in anterior half glabrous, lustrous. Body length of late instar larvae 7–8 mm, width of head up to 1.5 mm.

Material: Collected in the forests of Ussuri-Primor'e region. Adults six, larvae four.

191 *Distribution*: Ussuri-Primor'e region (Ussuriisk, Lake Khasan, Kamen'-Rybolov on Lake Khasan, Khabarovsk region). Northeast China, northern Korean peninsula.

Biology: Inhabits broad-leaved forest zones. Ecologically associated with mulberry, possibly with other woody plant species. Beetles fly in July and August and infest shoots up to 2.2 cm diameter. Larvae initially live under bark, make longitudinal galleries impressed weakly in wood, and fill them with frass. Midinstar larvae bore into wood, make a gallery there longitudinal to the shoot, and fashion a cell at end of gallery. Beetles appear June-end and in July, emerging from wood in July and early August.

Pterolophia maacki (Bless.) was found by us only on mulberry (*Morus bombycis*). *Exocentrus ussuricus* Tsher. is found together with this species on the very same shoots.

3. **Pterolophia jugosa** Bat.

Bates, 1873. *Ann. Mag. Nat. Hist.*, 4, 12: 351; Kojima and Okabe, 1960. *Food Plants of Japan, Ceramb.*, 50: 197; Kojima and Hayashi, 1969. *Insects' Life in Japan*, 1: 111; Krivolutskaya, 1973. *Entomofauna Kuril'skikh ostrovov*, 108.

Adult (Fig. 104): Well distinguished from other species of the genus by broad transverse bluish-green-white pilose depressed band on elytra before middle. Head short, with dense adherent whitish and somewhat rusty

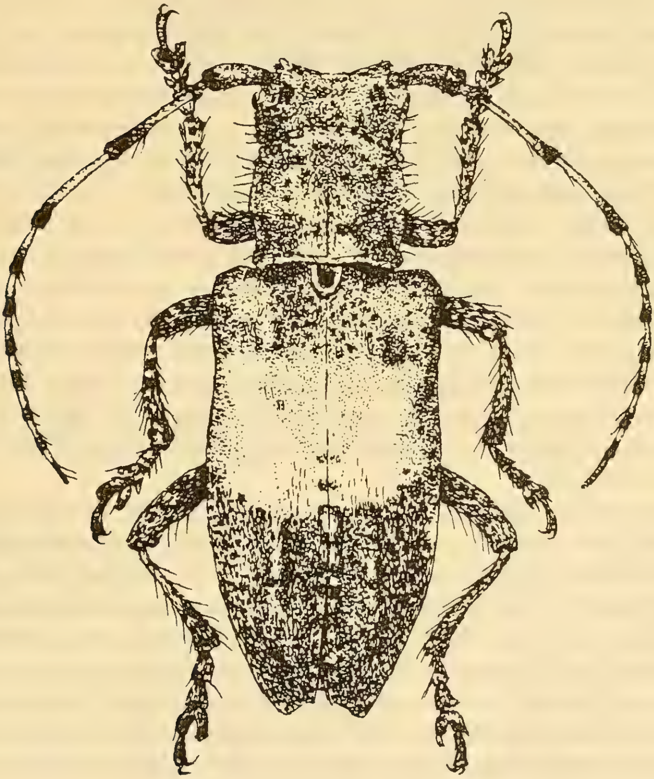


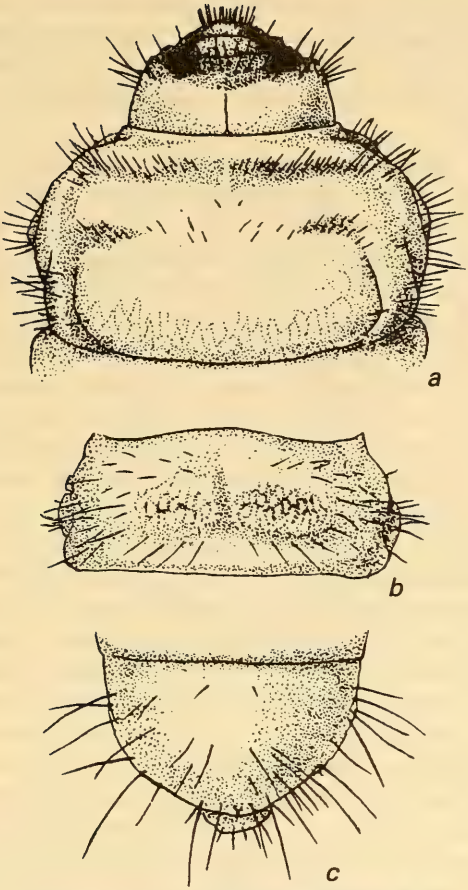
Fig. 104. *Pterolophia jugosa* Bat.

(mixed) hairs, in anterior half (frons, genae, and temples) with long bright erect bristles, medially with narrow longitudinal groove passing from frons to posterior margin of occiput. Eyes convex, sharply and boldly faceted, almost up to posterior margin deeply emarginate, with narrow black pin-
192 point interspace. Upper ocular lobe half size of lower. Antennae distinctly shorter than body (female) or barely reaching apex of elytra, with dense adherent hairs, on inner side with dense bristles; 4th segment basally with broad, 5th–11th segments with narrow whitish-bluish-green pilose ringlet. Third antennal segment equal to 4th, 1.5 times longer than 5th.

Pronotum parallel-sided, in length not more or even less (female), rarely slightly more (male) than basal width, near anterior and at posterior margin with faint narrow transverse groove, disk convex, medially with more or less perceptible groove, with dense rusty-golden and whitish-bluish-green compact adherent hairs. Pronotal shield triangular, posteriorly rounded, medially with brownish-black, along margins with dense bluish-green-white hairs forming bright fringe.

Elytra parallel-sided, with straight humeri, in posterior third roundly tapering, apically obtuse, disk convex, with steeply sloping hind clivus, before middle broadly transversely depressed, here with dense bluish-green-white compact adherent hairs forming bright broad transverse band, in remaining part with rusty-golden and gray hairs imparting common bronze tone, on disk before transverse depression with projecting tubercle, behind depression with sharp longitudinal ridge, laterally with long, more or less distinct, thin longitudinal ridge, laterally and along suture with black spotlets. Often, transverse whitish-bluish-green band with less pilose pattern consisting of extensive evanescent marks—two on disk triangular (with backward projecting angle) and one transversely extended mark on sides. Legs thin, not very long, with dense compact adherent rusty-golden and whitish hairs, with sparse long projecting bright bristles. Mid- and hind tibiae on outer side with distal black setiform brush. Body ventrally with compact gray pubescence and semierect bright piliform bristles. Body length 7–10 mm.

Larva (Fig. 105): Body white, comparatively thick, apically obtusely rounded. Head roundly tapering anteriorly. Epistoma throughout length distinctly divided by medial suture, laterally fusing with temporo-parietal lobes, frontal sutures not perceptible, at anterior margin with dark brown fringe, behind it with long setiform hairs in transverse row. Hypostoma parallel-sided, with narrow rounded anterior angles, barely convex, almost flat, rusty, medially with narrow white longitudinal band, in anterior half with two thick paramedial bristles. Temporo-parietal lobes somewhat bright rust, at anterior margin with narrow brownish-rust fringe, behind it with long setiform hairs in transverse row. Antennae whitish, segments apically



193 Fig. 105. Larva of *Pterolophia jugosa* Bat.

a—head and pronotum; b—abdominal tergite with dorsal locomotory ampulla; c—abdominal tergite IX with terminal spinule.

with somewhat rusty-brown ringlet, short, barely projecting from antennal sockets. Ocelli below antennae ampullaceous, whitish, transversely slightly elongate. Clypeus three times wider than long, trapezoid, somewhat rusty. Labrum transverse, at anterior margin broadly rounded, whitish, in anterior half with bright sparse bristles. Mandibles barely elongate, apically obliquely truncate, black, basally reddish, here on outer side with broad longitudinal groove bearing long spinule terminally.

Pronotum roundly tapering anteriorly, considerably sloping toward head, at anterior margin with rusty hairs forming dense transverse band
193 slightly interrupted medially, behind this band somewhat rusty, before shield

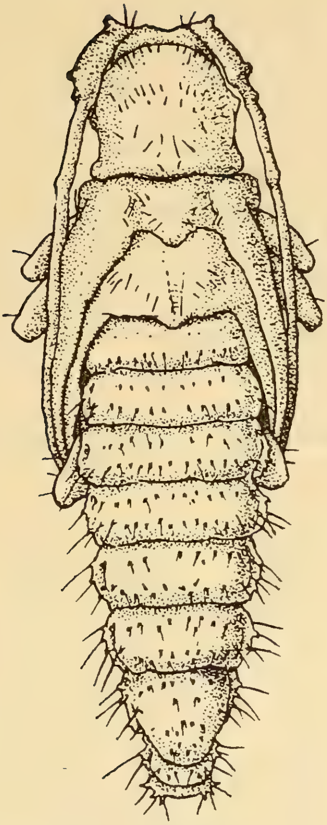
with sparse rusty hairs. Pronotal shield white, coriaceous, slightly lustrous, with minute longitudinal striae, laterally demarcated by deep longitudinal folds. Prosternum with long rusty hairs, laterally with extensive lustrous glabrous area, at base (basisternum s. sternellum) glabrous, coriaceous, not sclerotized.

Abdomen comparatively thick, laterally with bright, not very dense hairs. Dorsal locomotory ampullae convex, with common medial longitudinal groove, with ampullaceous, nonsclerotized granules forming three indistinct transverse rows. Ventral locomotory ampullae slightly convex, with minute uniform ampullaceous granules forming two transverse, distinctly projecting rows, sometimes slightly shifted laterad. Abdominal sternite IX in posterior half with eight large rusty hairs forming transverse row. Tip of abdomen obtusely rounded, with sparse, somewhat rusty hairs. Body length of late instar larvae 12–17 mm, width of head 2.0 mm.

Pupa (Fig. 106): Characterized by short falcate antennae bent forward on ventral side, presence of thin bristles on pronotum forming three transverse bands, and absence of urogomphus at tip of abdomen. Body white, moderately elongate. Head broad, almost not narrower than pronotum. Frons flat, broad, medially with narrow longitudinal groove, laterally with 194 insignificantly projecting antennal tubercles, around lower ocular lobe with three, near antennae two, at anterior margin six bristles forming transverse row. Beyond antennae near upper ocular lobe one large bristle present on each side. Labrum on disk with dense rusty bristles forming transverse band, apically with shortened bristles in small cluster. Antennae in second half bent ventrad, here in front of hind tarsi their apices curve forward.

Pronotum parallel-sided, length almost not more (male) or less (female) than width, disk uniformly convex, near anterior and posterior margins with transverse groove, with thin bristles forming three transverse bands—one at anterior margin, second medially, and third, less distinct, at posterior margin. Mesonotum convex, beyond middle transversely insignificantly depressed, at posterior margin with triangularly elongate shield; shield with short apical bristles forming small cluster, laterally with solitary bristles. Metanotum convex, medially with longitudinal groove, laterally with very minute dispersed setigerous spinules.

Abdomen almost parallel-sided, from segment V tapering toward tip. Abdominal tergites convex, with barely perceptible narrow median longitudinal band, on segments I–II with minute, on segments III–VI with large acute setigerous spinules forming two transverse rows—one near anterior, the other near posterior margin. Spinules directed backward, only at posterior margin of tergites V and VI directed forward in some individuals. Tergite VII triangular, apically narrowly rounded, disk convex, with large acute setigerous spinules forming two transverse bands—one



193 Fig. 106. Pupa of *Pterolophia jugosa* Bat.

at base, the other posteromedial. Tergite VIII transverse, hyaline, near anterior margin with six setigerous spinules forming transverse row. Tip of abdomen obtuse (in posterior view) with tetragonal area bound laterally by ridges bearing five setigerous spinules; urogomphus on dorsal side absent. Valvifers of female small hemispherical, compactly contiguous. Body length 9–12 mm, width of abdomen 3–4 mm.

Material. Collected on Kunashir Island. Adults 31, larvae 42, pupae 14 males and females, larval and pupal exuviae with beetles from cells 5.

Distribution: Kunashir Island (Alekhini, Sernovodsk), islands of Japan (Hokkaido, Honshu, Shikoku).

Biology: Inhabits broad-leaved forests of the Pacific Ocean islands. Flight of beetles is completed in the second half of summer. Larvae live under bark, make sinuous longitudinal galleries, and fill them with fine frass. Galleries are impressed in upper layer of wood. Larvae of mid- and late instars bore into wood, leaving an entry hole up to 3.5–3.8 mm wide on the surface. After the second hibernation, larvae make longitudinal gallery in wood, then a pupal cell at end of gallery longitudinal, or more often transverse, to the stem, and at end of cell an exit up to the bark, filling it with frass. They pupate with their head toward the exit. Length of larval gallery under bark 10.0–21.5 cm, width up to 5.0 mm. Length of gallery in wood 2.5–3.5 cm, width up to 5.0 mm. Length of cell 9–15 mm, width 4–6 mm. Pupal cell round in transverse section.

Pupation of larvae begins in the last ten days of July and is completed by mid-August. Pupae are found up to the last week of August. In 1974, on Kunashir under natural conditions, with temperature fluctuation from 10°C in the morning to 32°C later in the day (average diurnal temperature
195 19.4 ± 0.5°C), beetles emerged after 15–19 days (average 16.8 ± 0.5). Developed beetles discard frass through the entry hole and nibble a round flight opening (diameter 3–5 mm) on surface of shoot and exit through it. Emergence of beetles from cells is completed in the second half of August. Generation—two-year cycle. This is confirmed by the fact that in the second half of summer, in addition to pupae, we found larvae of midinstars preparing for the second hibernation. Based on 31 individuals, larvae before pupation weigh 22–103 mg (49.5 ± 3.9), pupae 20–94.3 mg (44.8 ± 3.6), beetles before emergence from cells 16–82 mg (36.1 ± 3.1). One larva before pupation weighed 56 mg (100%), the pupa developed from it 54 mg (96.4%), and the beetle emerging from it 42 mg (75%). The insect's weight reduced by 25% during metamorphosis.

Pterolophia jugosa Bat. infests shoots 2.5–7.5 cm diameter in drying trees, mainly elm. From the larvae collected in nature from elm, we raised 17 beetles. During forest inspections, 57 specimens (larvae, pupae) were collected—52 from elm, 2 mulberry, 2 alder, and 1 from birch. According to reports of some authors (Kojima and Okabe, 1960), this species develops on *Populus siboldi*, Fagus japonica, *Castanea crenata*, *Morus* sp., and other woody plant species.

2. Genus *Egesina* Pasc.

Pascoe, 1864. *Trans. Ent. Soc. Lond.*, 3, 3: 49–50; Aurivillius, 1922. In Junk: *Coleopt. Catalog.*, 73: 276; —*Niijimaja* Matsushita, 1933. *Journ. Facul. Hokkaido Imp. Univ., Sappro*, 34: 386; — *Baeckmanella* Shabliovsky. 1936. *Vestnik D.-Vost. filiala AN SSSR*, 186; Kojima and Hayashi, 1969. *Insects' Life in Japan*, 1: 112; Breuning, 1963. *Entom. Arbeit, aus dem Museum bei München*, 14, 2: 510–514.

The genus *Egesina* Pasc. is known to include more than 40 species

(Bréuning, 1963) belonging to five subgenera (*Egesina* Pasc. s. str., 18; *Niijmaja* Matsush., 13; *Cuphisia* Pasc., 4; *Callegesina* Bréun., 3; and *Callinispia* Fisch., 6 species). In northern Asia, one species belonging to the subgenus *Niijmaja* Matsush. is known.

Type species: *Egesina rigida* Pascoe, 1864.

1. **Egesina bifasciana** (Matsush.)

Matsushita, 1933. *Journ. Facul. Hokkaido Imp. Univ., Sappro*, 34: 387 (*Niijimaja*); — *iljinskyi* Shabliovsky, 1936. *Vestnik D.-Vost. filiala AN SSSR*, 186–187 (*Baeckmanella*); Greesit, 1951. *Longic. Beetles of China*, 2: 516 (*Niijmaja*); Kojima and Hayashi, 1969. *Insects' Life in Japan*, 1: 112.

Adult (Fig. 107): Characterized by small body, comparatively dense erect hairs throughout body surface, and stable pattern on elytra. Head retracted into prothorax almost up to eyes, with deep compact punctation and sparse minute adherent and long erect hairs. Frons broad, convex,

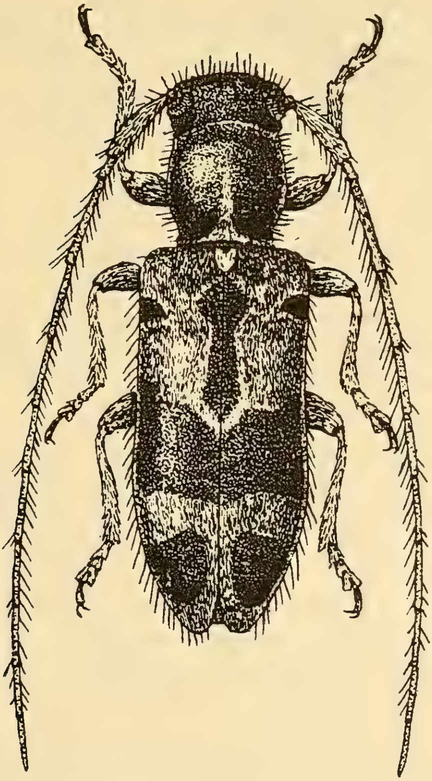


Fig. 107. *Egesina bifasciana* (Matsush.).

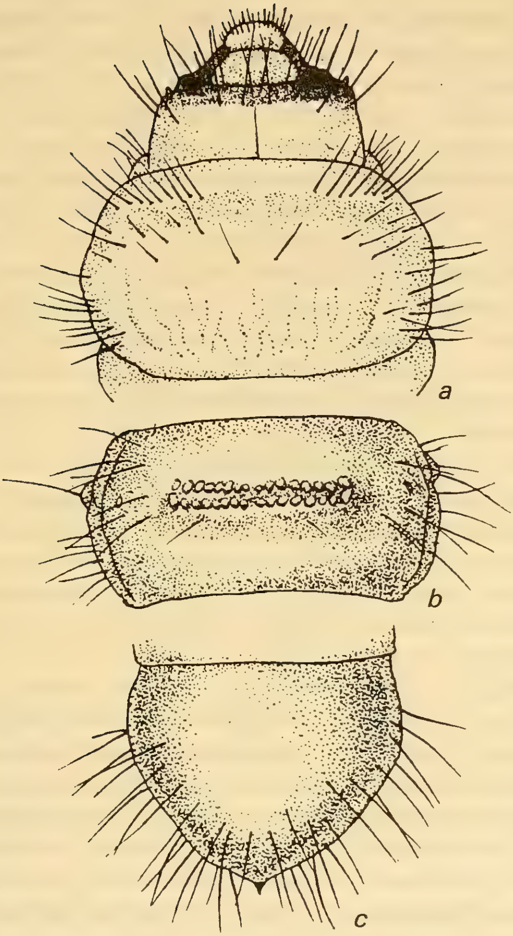
with narrow smooth median longitudinal groove, antennal tubercles barely produced, indistinct. Eyes sharp, finely faceted, highly incised; interspace of ocular lobes narrow, smooth, or with projecting facets. Antennae longer than body, extending beyond apex of elytra by 8th (male) or 10th (female) segment, with very fine punctation and sparse short adherent hairs, on inner side with long dense bristles. First antennal segment elongate, slightly enlarged, apically rounded, not shorter than 3rd, distinctly longer than 4th.

Pronotum slightly longer than apical width, in anterior half parallel-
sided, in posterior half distinctly tapering, basally with flange, apically
196 more uniform, entire, at posterior and anterior margins slightly curved,
disk convex, with deep compact punctation and gray adherent hairs directed
posteromedially in anterior half, anteromedially in posterior half, forming
on commissure two narrow median longitudinal whitish pilose bands (anter-
ior and posterior) converging at central point. Pronotal shield insigni-
ficantly tapering toward apex, rounded posteriorly, with dense whitish-gray
compact adherent hairs.

Elytra in medial third insignificantly enlarged, tapering toward apex in posterior fourth, apically jointly rounded, before middle on disk broadly depressed, with insignificantly projecting tubercle, with deep, comparatively dense punctation and dense adherent and numerous semierect setiform hairs, with white pilose bands—one narrow, extending inward from lateral margin beyond humeral tubercle, on disk recurved and here uniting with the second broad triangular band extending longitudinally up to the middle and emarginate at inner margin, the third band before hind clivus transverse, uniting with perisutural and lateral white fringe demarcating on hind clivus dark brown triangular area. Anterior bands often fuse and form a common extensive whitish-gray pilose field demarcating the perisutural tubercular arrow-shaped band. Legs with white adherent hairs; tibiae on outer side (partly femora) with long semierect bristles, midtibiae on outer margin without distal notch; 1st segment of hind tarsi shorter than next two segments together (female) or almost equal to them (male). Body ventrally with compact adherent whitish-gray and long semierect hairs. Sternite V broad, apically obtuse, disk with median longitudinal groove (female) or narrow, apically rounded, medially without perceptible longitudinal groove (male). Body black or blackish-brown. Antennae from 1st to 11th segments somewhat rusty. Femora blackish-brown or black, tibiae and tarsi somewhat rusty. Body length 4–5 mm.

Egg: White, insignificantly elongate, perceptibly tapering toward caudal pole, at poles rounded. Chorion smooth, without perceptible sculpture. Length 0.8 mm, width 0.4 mm.

Larva (Fig. 108): Characterized by acute sclerotized apical spinules on tergite IX. Head parallel-sided, half retracted into prothorax. Epistoma



197 Fig. 108. Larva of *Egesina bifasciana* (Matsush.).

a—head and pronotum; b—abdominal tergite with dorsal locomotory ampulla; c—tip of abdomen.

slightly convex, bright, divided throughout length by median longitudinal suture, laterally fusing with temporo-parietal lobes (frontal sutures not perceptible), at anterior margin with uniform lustrous dark brown fringe, behind it with long bright setiform hairs in transverse row. Hypostoma parallel-sided, with distinct lateral sutures, twice wider than long, laterally some-
197 what rusty, medially with bright longitudinal band, at anterior margin gently emarginate, toward angles slightly sloping, in anterior half with pair of

wide-set bristles. Temporo-parietal lobes at anterior margin with somewhat rusty-brown fringe covering ocular-antennal zone. Antennae whitish, their apices barely projecting from antennal sockets. Ocelli ampullaceous, slightly elongate. Clypeus relatively large, bright, trapezoid. Labrum transverse, at anterior margin broadly rounded, in anterior half with bright bristles. Mandibles reddish-rust, apically black, here steeply slanting, with insignificantly extending lower (ventral) and projecting dorsal denticle.

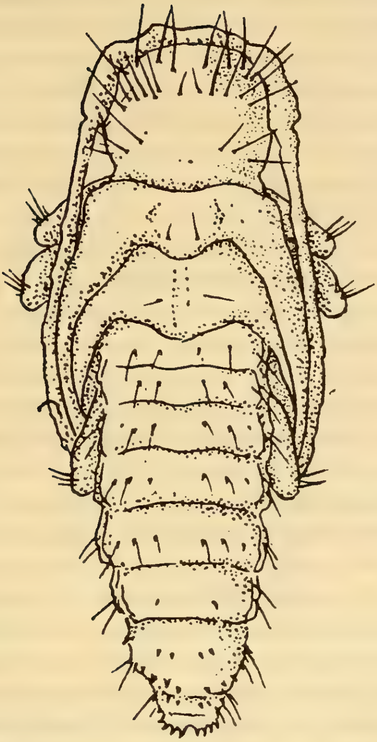
Pronotum slightly tapering anteriorly, sloping toward head, at anterior margin with broad whitish fringe, behind it with long bright (laterally long, medially short) hairs forming transverse row; behind this row yellowish, before shield with solitary very short, laterally numerous long bright rusty hairs. Pronotal shield white, coriaceous, smooth, slightly convex, without bristles, laterally demarcated by deep longitudinal diverging folds, at anterior margin directly truncate. Prosternum with sparse bright rust hairs, at base (basisternum s. sternellum) and in posterior half of eusternum glabrous, coriaceous, not sclerotized.

198 Abdomen moderately elongate, laterally with sparse bright hairs. Dorsal locomotory ampullae with distinct ampullaceous granules. Ventral locomotory ampullae with ampullaceous granules forming two distinct transverse rows divided by narrow transverse groove. Abdominal tergite IX on disk convex, glabrous, laterally and in posterior third with bright hairs, apically with acute sclerotized spinule. Body length of late instar larvae 7–8 mm, width of head 1.8 mm.

Pupa (Fig. 109): Characterized by very long bristles on pronotum and short setigerous spinules on abdominal tergites. Head broad, on occiput broadly rounded. Frons broad, insignificantly convex, almost flat, with wide-set antennal tubercles, at anterior margin with two pairs of bristles in transverse row, behind base of antennae with two close-set, before base three–four wide-set bristles. Labrum on disk with 8–10 long bristles forming interlacing transverse row, apically with solitary bristles or without them. Antennae flexed laterad, behind midfemora looped, curved forward, their apices bent toward foretibiae.

Pronotum tapering toward base, in anterior half parallel-sided, near posterior margin with narrow transverse groove, disk convex, lustrous, near anterior margin with 6–8, medially with 12–16 long bristles forming two transverse bands, hind clivus near posterior angles with 4–5 bristles forming transverse row.

Abdomen elongate, parallel-sided, gradually tapering in posterior third. Abdominal tergites uniformly convex, beyond middle with minute setigerous spinules forming uniform transverse row (two–three spinules paramedially). Tergite VII posteriorly broadly rounded, disk convex, lustrous, in posterior half with six–eight randomly dispersed setigerous spinules.



197 Fig. 109. Pupa of *Egesina bifasciana* (Matsush.).

Tergite VIII short, posteriorly rounded, disk with four minute spinules in transverse row. Tip of abdomen obtuse, bound by semicircular ridge bearing up to 10 setigerous spinules. In females these spinules more developed, but in males less so. Valvifers of female small, hemispherical, with very narrow interspace. Body length 5.5–6.0 mm, width of abdomen up to 1.1 mm.

Material: Collected in Ussuri-Primor'e region. Adults 430, larvae 63, pupae 4 males and 3 females, larval exuviae with beetles from cells 24.

Distribution: Ussuri-Primor'e region, Sakhalin, Japan, Korean peninsula, northeast China.

Biology: Inhabits broad-leaved and mixed forests. Ecologically associated with pear, mulberry, oak, and other woody and bushy plant species. Young beetles emerge from wood mainly in July. For example, in 1971–1972, of every 100 beetles found, 61 emerged in the first half of July, 36 the second half, and 3 early August. Young beetles require supplementary feeding. On emerging from cells, beetles fly to thin shoots of trees and feed on the bark. They mate after maturation of gonads and the females oviposit on shoots from 0.6 to 2.4 cm diameter.

Larvae live under bark, make longitudinal sinuous, sometimes squarish, enlarging galleries, and fill them with fine frass. Larvae of last instar bore into wood, there make a pupal cell in the upper layer longitudinal to the shoot, and pupate in it with their head directed opposite to the entry hole. Width of entry hole into wood 2.5 mm. Length of pupal cell 7–8 mm, width 2.0–2.5 mm.

199 Pupation of larvae begins in June and is completed in July. Pupae develop in about three weeks. Under laboratory conditions at room temperature, they developed in about 22 days, in another instance in 26 days. Based on 38 individuals, larvae before pupation weigh 3.4–11.0 mg (7.2 ± 0.3), pupae 2.6–10.3 mg (6.1 ± 0.3), young beetles before emergence from wood 2–8 mg (4.7 ± 0.2). During metamorphosis, the insects lost weight up to 23% (Cherepanov and Cherepanova, 1974). Young beetles nibble oval flight openings (1.5 mm × 2.0 mm) on the shoot surface and exit from cells through them. Generation—two-year cycle.

Egesina bifasciana (Matsush.) develops on thin shoots of many deciduous plant species. For example, from the larvae collected in nature, we raised 391 beetles—115 on pear, 104 mulberry, 53 maple, 37 oak, 29 elm, 22 daphne (*Daphne kamtschatica*), 10 cranberry, 10 hornbeam, 4 ash, 2 each acanthus, apple, and white beam tree, and 1 on Manchurian walnut. In addition, during forest inspections, 64 specimens were collected—24 from mulberry, 16 oak, 8 cranberry, 6 pear, 5 elm, and 1 each from maple, daphne, apricot, ash, and acanthus. *Cylindilla grisescens* Bat. and *Anaesthetis confossicollis* Baeckm. coexist with this species on thin shoots of oak and pear, and *Exocentrus ussuricus* Tsher. and *Pterolophia ussuriensis* Plav. on mulberry.

33. Tribe APOMECYNINI

Adults: Characterized as follows: Head short, broad; frons rectangular; antennal tubercles sufficiently extended laterad; antennae slightly longer (*Asaperda* Bat.) or shorter (*Microlera* Bat.) than body. First antennal segment apically rounded, without cicatrix. Pronotum laterally with produced tubercle (*Asaperda* Bat.) or angularly rounded, sometimes with barely perceptible tubercle (*Microlera*), near base with more or less distinct flange. Elytra parallel-sided (*Asaperda* Bat.) or perceptibly tapering toward base (*Microlera* Bat.), disk uniformly convex (*Asaperda* Bat.) or beyond shield gently depressed, in posterior third convex, hind clivus steeply sloping (*Microlera* Bat.). Midtibiae on outer margin with distal notch bearing dense brush of brownish bristles.

Larvae: Body elongate. Head slightly retracted into prothorax. Frontal sutures demarcating epistoma distinct. Hypostoma fusing with temporoparietal lobes, lateral hypostomal sutures not perceptible. Pronotal shield white, coriaceous, not sclerotized. Dorsal locomotory ampullae with two transverse rows of ampullaceous granules developed on metanotum and on abdominal tergites I, VI, VII. Ventral locomotory ampullae similar, located on meso- and metasterna, and on abdominal sternites I, VI, VII. Segment IX of abdomen short, in posterior half with long dense hairs. Abdominal tergite IX apically without spinule.

Pupae: Distinguished by long solitary bristles frontally on head. Antennae beyond midfemora bent ventrad, there curved annularly forward, their apices inclining toward forelegs. Pronotum laterally with large produced tubercle covered with dense bristles. Abdomen elongate, on tergites with long bristles directed backward or with acute acicular spinules, apically with produced urogomphus terminating in sclerotized spinule.

In the fauna of northern Asia two genera, ecologically associated with deciduous plantations, are known in the tribe Apomecynini. Larvae and pupae have been identified for species of the genus *Asaperda* Bat. but to date remain unknown for the genus *Microlera* Bat.

200

KEY TO GENERA

1 (2). Elytra parallel-sided, not tapering toward base, disk uniformly convex, beyond shield not depressed. . . . . 1. **Asaperda** Bat.
2 (1). Elytra not parallel-sided, distinctly tapering toward base, disk in posterior third more convex, beyond shield broadly rounded. . . . . 2. **Microlera** Bat.

1. Genus *Asaperda* Bat.

Bates, 1873. *Ann. Mag. Nat. Hist.*, 4, 12: 385; Kraatz, 1873. *Deutsche Ent. Zeitschr.*, 23: 227; Kojima and Hayashi, 1969. *Insects' Life in Japan*, 1: 99; Cherepanov and Cherepanova, 1981. *Nasekomye i kleshchi Sibiri* (*nov. i maloizv. vidy fauny Sibiri*), 42.

Adult: Characterized by elongate body. Head short, broad, antennal tubercles more or less extending laterally, frontally with median longitudinal groove, with dense adherent hairs, beyond eyes on temples with long erect piliform bristles forming cluster (*A. agapanthina* Bat., *A. stenostola* Kr.) or without them (*A. rufipes* Bat.). Antennae slightly longer than body, on inner side with long bristles. Pronotum laterally with large produced tubercle, near base with sharp flange, with recurved (*A. rufipes* Bat.) or not recurved (*A. agapanthina* Bat.) posterior margin, laterally with long thin erect hairs (*A. stenostola* Kr., *A. agapanthina* Bat.) or without them (*A. rufipes* Bat.). Elytra with deep interlacing (*A. rufipes* Bat., *A. stenostola* Kr.) or not interlacing, partially punctate rows (*A. agapanthina* Bat.) and dense (*A. agapanthina* Bat., *A. rufipes* Bat., *A. meridiana* Matsush.) or sparse (*A. stenostola* Kr.), speckled (*A. agapanthina* Bat.) or monochromatic (*A. meridiana* Matsush., *A. rufipes* Kr.) pubescence.

Larva: In general habits and structure of abdominal segment IX, similar to the larvae of the genus *Agapanthia* Serv. Body parallel-sided. Head barely retracted into prothorax, slightly bent downward. Epistoma laterally demarcated by distinct white frontal sutures. Hypostoma fusing with temporo-parietal lobes. Hypostomal sutures barely perceptible. Pronotum on disk with broad, somewhat rusty or brownish-rust, glabrous mark. Pronotal shield white, coriaceous, convex. Thoracic legs absent. Dorsal locomotory ampullae with ampullaceous granules, forming two transverse rows, developed on metanotum and on abdominal tergites I, VI, and VII. Spiracles round, with brownish peritremes. Abdominal segment IX obtuse posteriorly, at posterior margin with long dense, somewhat rusty hairs forming tuft (visible in posterior view).

Pupa: Body elongate. Head moderately projecting, frontally with long solitary bristles, between antennae with broad longitudinal trough. Antennae flexed laterad, bent toward ventral side, there curved annularly forward, their apices generally inclining toward forelegs. Pronotum laterally with large produced tubercle, densely covered with bristles. Abdomen at tip with long urogomphus terminating in acute sclerotized spinule. Abdominal tergites convex, at posterior margin with long bristles directed backward (*A. agapanthina* Bat.) or with acute setiform spinules (*A. stenostola* Kr.).

201 In northern Asia four species belong to the genus *Asaperda* Bat., in Japan not less than five, and in southeast Asia certainly at least ten. All of these species inhabit broad-leaved forests and are ecologically associated with deciduous woody and bushy plant species.

Type species: *Asaperda rufipes* Bates, 1873.

KEY TO SPECIES

Adults

1 (6). Elytra with dense pubescence, at least partially covering punctation.

2 (5). Temples and pronotum laterally with long piliform erect and projecting bristles.

3 (4). Elytra with speckled pubescence, with transverse brownish band. Antennae and legs brownish. Sakhalin, Kunashir, Japan .... **1. A. agapanthina** Bat.

4 (3). Elytra with monochromatic grayish pubescence, without transverse brownish band. Antennae and legs rusty. Kunashir, Taiwan. . . . . 2. **A. meridiana** Matsush.

5 (2). Temples and pronotum laterally without long piliform bristles, only with compact adherent pubescence. Elytra with monochromatic grayish-rust pubescence, without transverse brownish band. Ussuri-Primor'e region, Japan. . . . . 3. **A. rufipes** Bat.

6 (1). Elytra with sparse pubescence, not covering punctation. Ussuri-Primor'e region. . . . . 4. **A. stenostola** Kr.

Larvae

1 (4). Abdominal sternite IX without pitlike depressions.

2 (3). Temporo-parietal lobes with two rows of long setiform hairs covering only their anterior third. On magnolia, mulberry, apple, and other deciduous plants. . . . . 1. **A. agapanthina** Bat.

3 (2). Temporo-parietal lobes with three interlacing rows of setiform hairs covering almost two-thirds anterior part. On alder . . . . 3. **A. rufipes** Bat.

4 (1). Abdominal sternite IX laterally with pitlike depression. On acanthus. . . . . 4. **A. stenostola** Kr.

Pupae

1 (4). Bristles on pronotal disk not forming median transverse band, constituting only a cluster on each side.

2 (3). Abdominal tergite VII in posterior half with sparse bristles forming transverse row. . . . . 1. **A. agapanthina** Bat.

3 (2). Abdominal tergite VII in posterior half with dense bristles forming common cluster. . . . . 3. **A. rufipes** Bat.

4 (1). Bristles on pronotal disk in middle forming median transverse band slightly interrupted medially . . . . 4. **A. stenostola** Kr.

202 1. **Asaperda agapanthina** Bat.

Bates, 1873. *Ann. Mag. Nat. Hist.*, 4, 12: 386; Kojima and Hayashi, 1969. *Insects' Life in Japan*, 1: 99; Krivolutskaya, 1973. *Entomofauna Kuril'skikh ostrovov*, 108; Cherepanov and Cherepanova, 1981. *Nasekomye i kleshchi Sibiri* (*nov. i maloizv. vidy fauny Sibiri*), 42–45.

Adult (Fig. 110): Body elongate. Head frontally between antennae with deep median longitudinal groove, antennal tubercles highly extended laterally, with deep bold compact punctation, dense grayish adherent hairs, temples with long dense, projecting bright bristles. Eyes sharply faceted,

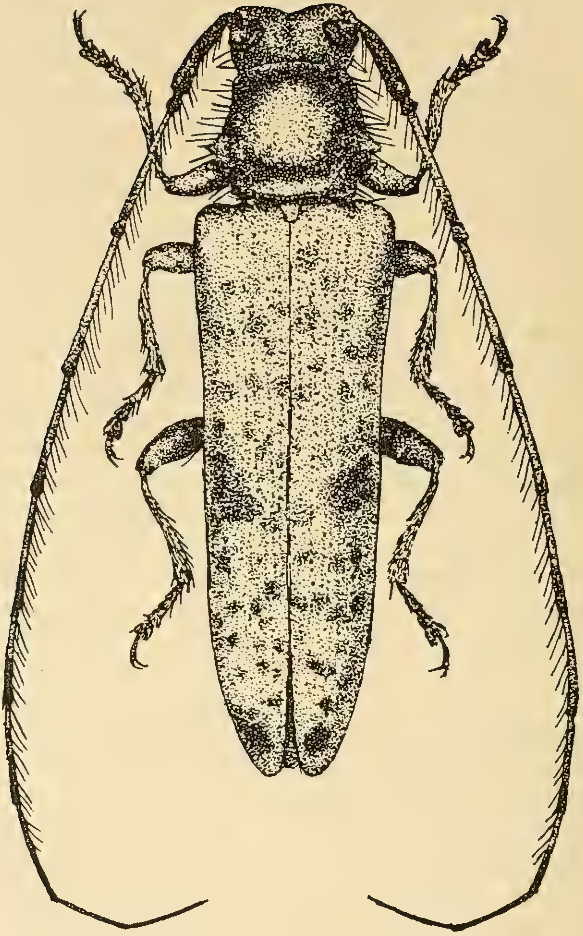


Fig. 110. *Asaperda agapanthina* Bat.

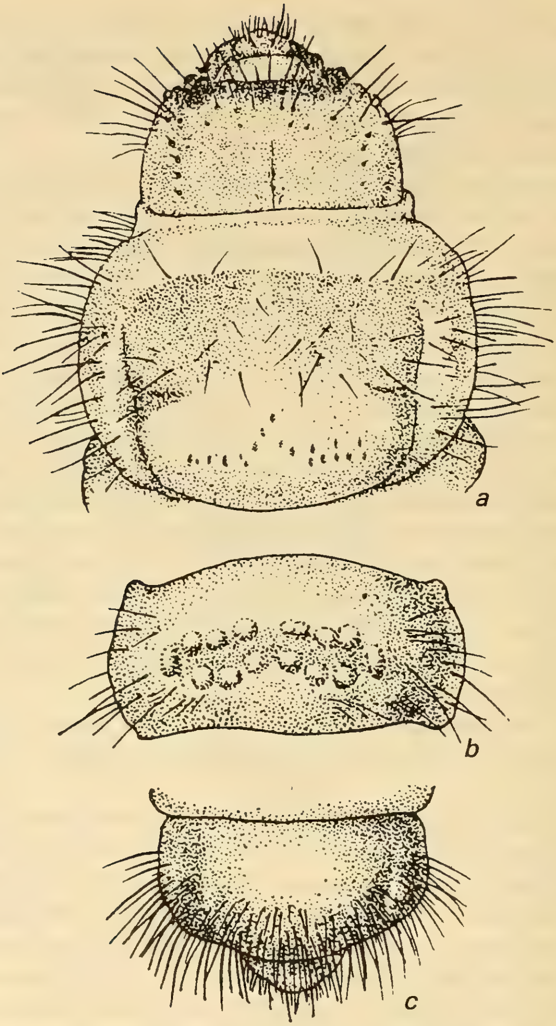
emarginate almost up to posterior margin; upper ocular lobe half length of lower. Antennae longer than body, extending beyond apex of elytra by 8th (male) or 10th (female) segment, with sparse minute adherent hairs, on inner side of 1st–7th segments with dense dark brown bristles. First antennal segment thick, with vanishing punctation and shagreen sculpture; 3rd segment slightly longer than 4th.

Pronotum slightly longer (male) or not longer (female) than basal width, laterally with large, arcuately produced, conical tubercle, at posterior margin with sharp flange, in anterior third with gentle transverse groove, disk convex, with minute punctation, with dense grayish-yellow hairs (directed backward from front, from sides mediad, on hind clivus anteromediad), laterally with long erect, projecting dark brown bristles. Pronotal shield flat, barely elongate, posteriorly broadly rounded, with dense adherent yellowish hairs.

Elytra elongate, parallel-sided (female) or gradually tapering toward apex (male), apically individually rounded, basally with rounded, not projecting humeri, disk uniformly convex, with deep punctures often concealed by pubescence and forming more or less distinct longitudinal rows, with dense grayish and brownish-rust hairs forming against common gray background dark brown speckled spots and broad dark brown median transverse band. Punctation on elytra sometimes forming such distinct longitudinal rows that pubescence appears as narrow longitudinal bands. Body
203 ventrally with dense compact adherent pubescence and sparse thin semierect setiform hairs. Abdominal sternite V entire, apically slightly emarginate (male) or in posterior half with pitlike depression and apically truncate (female) Legs with adherent gray hairs; tibiae on outer side with long thin bristles. Femora thick, medially enlarged, midtibiae at outer margin with small distal notch, hind tarsi insignificantly shorter than tibiae. Body black. Legs rusty, femora (especially basally) and tarsi often black. Antennae rusty, their 1st segment and apex of remaining segments blackish-brown. Body length 9–13 mm.

Egg: White, elongate, barely tapering toward caudal pole, at poles broadly rounded. Chorion smooth, semitransparent. Length 1.5 mm, width 0.5 mm.

Larva (Fig. 111): In general habits similar to the larvae of the genus *Agapanthia* Serv. Distinguished by obtuse, densely pilose tip of abdomen, brownish specklike spots on pronotal shield, and distinct fringe of hairs basally on epistoma. Body elongate, white. Head parallel-sided, barely retracted into prothorax, slightly bent downward. Epistoma triangular, in
204 posterior half divided by median longitudinal brownish suture, laterally demarcated by narrow distinct whitish frontal sutures, at anterior margin with narrow brownish fringe, behind it with eight large followed by eight–ten minute bristles forming, accordingly, two transverse rows. These spinules basally fringed with sclerotized ringlet. Hypostoma convex, somewhat rusty, laterally demarcated by barely perceptible sutures, with narrow median longitudinal white band and two–three thick paramedial bristles. Temporoparietal lobes somewhat rusty, in general tone blending with hypostoma, at anterior margin with narrow brownish fringe, in anterior half with coarse thick bristles forming two transverse rows, on upper side with four–six setigerous pores in longitudinal rows. Antennae very short, whitish. Ocelli (below antennae) ampullaceous, whitish. Clypeus transverse, slightly trap-



203 Fig. 111. Larva of *Asaperda agapanthina* Bat.

a—head and pronotum; b—abdominal tergite with dorsal locomotory ampulla; c—tip of abdomen.

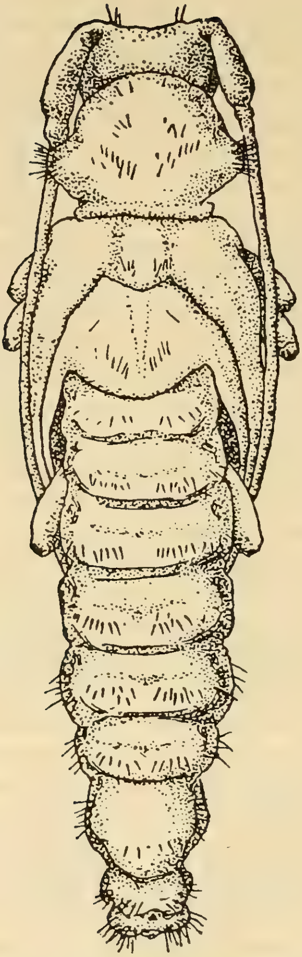
ezoid. Labrum transversely oval, in posterior half with four long bristles in transverse row, in anterior half with short thin brownish bristles, basally brownish, in anterior half whitish. Mandibles apically slanting, with acute ventral denticle.

Pronotum highly sloping toward head, at anterior margin with broad whitish fringe, between it and shield on disk with rusty lustrous area, laterally with triangular rusty spot, at anterior margin of rusty area with setiform rusty hairs forming transverse row, before shield with sparse short, laterally with dense and much longer rusty hairs. Pronotal shield convex, lustrous, white, without bristles, laterally demarcated by long longitudinal grooves almost reaching anterior margin of rusty area, in posterior half with brownish, slightly longitudinal, elongate specklike spots forming transverse band. Prosternum with long rusty hairs forming individual clusters, laterally with yellow triangular spot, at base (basisternum) medially glabrous, laterally with somewhat rusty hairs. Meso- and metasterna divided by median transverse groove fringed with two rows of large ampullaceous granules, in anterior half and laterally with somewhat rusty hairs.

Abdomen elongate, spiracles round, with brownish peritremes. Abdominal tergite I convex, divided by median transverse groove fringed with minute ampullaceous granules forming two transverse rows. Tergites II–V smooth, locomotory ampullae not developed on them. Abdominal tergites VI–VII with fully developed locomotory ampullae having two transverse rows of ampullaceous granules—posterior row having five large granules, anterior row with barely perceptible, poorly demarcated granules. Ventral locomotory ampullae well developed on abdominal sternites VI, VII, having two transverse rows of ampullaceous granules. Tip of abdomen obtuse. Segment IX at posterior margin with dense rusty hairs forming continuous pilose ring, in center of which lies anal segment (apex). Body length of late instar larvae 17–19 mm, width of head up to 2.0 mm.

Pupa (Fig. 112): Characterized by large tubercle covered with bristles laterally on pronotum, highly produced urogomphus at tip of abdomen, and other characters. Body elongate. Head short, broad, between antennae with median longitudinal groove, with barely projecting antennal tubercles located in broad notch of eyes, inner to posterior ocular lobe with two adjacent, near anterior ocular lobe five–six bristles forming small cluster, at anterior margin near base of clypeus with six bristles forming transverse row broadly interrupted medially. Labrum elongate, apically obtuse, disk
205 with large bristles forming transverse row. Antennae flexed laterad, in second half on ventral side bent forward looplike, their apices inclining toward foretibiae (female) or extending beyond them, almost reaching stomatic apparatus (male).

Pronotum in basal width not less than or slightly less than its length, laterally with large, highly extended tubercle, densely covered with bristles, disk uniformly convex, basally with narrow grooved flange, near anterior margin with barely perceptible, transverse, groovelike trough, before trough with solitary bristles forming transverse row, on hind clivus with bristles forming two elongate clusters diverging laterally, medially with solitary bristles forming transverse row. Mesonotum in posterior half trans-



203 Fig. 112. Pupa of *Asaperda agapanthina* Bat.

versely depressed, saddlelike, at posterior margin with insignificantly extended shield, lateral to it with three–five bristles forming there one small cluster. Metanotum slightly convex, with median longitudinal groove, basally with six–seven paramedial bristles forming cluster on each side.

Abdomen elongate, parallel-sided or gradually tapering toward tip. Abdominal tergites convex, with narrow common median longitudinal groove, at posterior margin on each side of groove with 8–10 somewhat rusty bristles on sclerotized or coriaceous produced base forming transverse band. Tergites laterally with four–eight bristles forming an isolated cluster, in anterior half glabrous, without bristles. Tip of abdomen laterally bound by high, densely setaceous ridge, on dorsal side with highly extended urogomphus bearing long sclerotized spinule terminally. Valvifers of female large, hemispherical, lustrous, contiguous. Body length 10–18 mm, width of abdomen 2.5–3.0 mm.

Material: Collected on Kunashir Island. Adults 107, larvae 45, pupae 7 males and females, larval exuviae with beetles and pupae from cells 31.

Distribution: Southern Sakhalin, Kunashir. In Japan—Hokkaido, Honshu, Shikoku. On Kunashir, found in large numbers in the outskirts of Alekhino.

Biology: Inhabits broad-leaved forest zones. According to our observations on Kunashir Island, it is ecologically associated with magnolia, mulberry, apple, and other deciduous woody and bushy plant species. Flight of beetles begins mid-June and continues up to second half of August. Maximum beetles observed in July. Beetles lead a cryptic mode of life, do not visit flowers, and are found on the shoots of trees. They require supplementary feeding and nibble cork of thin shoots, inflicting injuries in the form of small abrasions of irregular shape. Beetles mate after maturation of gonads and the females then oviposit. The female uses its mandibles to make a cavity up to the heartwood (width of cavity on bark 3.0 mm, in wood 1.0 mm) on shoots 2–3 mm diameter and lays an egg in the heartwood. She makes a cavity only in the bark (width of cavity 2.5 mm) on shoots 1–3 cm diameter and lays an egg under the bark longitudinal to the shoot. Generally one egg is laid per cavity, very rarely two eggs.

Egg stage lasts two to two-and-a-half weeks. In 1974, from the eggs laid during August 2nd–6th, larvae began to hatch from the 21st day of this month. The atmospheric temperature during the incubation period varied from 15°C in the morning to 25°C later in the day (average temperature 18.2 ± 0.3°C). Hatching larvae break the chorion and make galleries longitudinal to the shoot up-downward. On thin shoots the galleries are
206 made through the heartwood, on thick shoots up to 2.0 cm diameter, under the bark. The latter galleries are impressed on sapwood. Larvae of late instars bore into wood up to the heartwood and there make a gallery longitudinal to the shoot. A cell is made at end of gallery and separated by a plug of fibrous frass. Width of entry hole into wood 5.0 mm. Length of gallery in wood 6–8 cm, width 4–5 mm. Length of cell 18–25 mm, width up to 5.0 mm. Length of plug separating cell from hollow gallery 5–8 mm. Larvae pupate in cell with their head toward the entry hole.

Pupation of larvae begins in May and is completed in June. Maximum pupae observed May-end. The pupal stage in nature lasts for three–four weeks. From a pupa formed on May 26th (Kunashir, Alekhino), the beetle emerged on June 17th. The atmospheric temperature during this period fluctuated from 3.8°C in the morning to 18.0°C later in the day (mean 9.4 ± 0.2°C). Based on 17 individuals, larvae before pupation weigh 33–82 mg (52.7 ± 3.0), pupae 28–69 mg (46.1 ± 2.6), beetles before emergence from wood 21–35 mg (36.4 ± 2.1). Generation—-two-year cycle.

Asaperda agapanthina Bat. infests thin shoots of viable and drying trees. The damaged shoots die, the canopy becomes rarefied, and the trees (magnolia) often die. From the larvae collected in nature (Kunashir Island, Alekhino), 91 beetles were raised—41 on magnolia, 28 mulberry, 10 apple, 4 Amur cork tree, 4 actinidia, 3 northern red currant, and 1 on elm. In addition, during forest inspections, 55 specimens (larvae, pupae, beetles) were found—16 from shoots of magnolia, 9 apple, 7 Amur cork tree, 8 northern red currant, 9 actinidia, 5 mulberry, and 1 from oak. In Japan (Kojima and Okabe, 1960), this species develops on *Ficus carica*, *Wisteria floribunda*, *Tilia japonica*, and *Morus* sp.

2. **Asaperda meridiana** Matsush.

Matsushita, 1931. *Trans. Sapporo N. H. Soc.*, 12: 45; — *takushensis* Kano, 1933. *Kontyu*, 6: 283; Gressit, 1951. *Longic. Beetles of China*, 2: 494; Kojima and Hayashi, 1969. *Insects' Life in Japan*, 1: 100; Krivolutskaya, 1973. *Entomofauna Kuril'skikh ostrovov*, 108.

Adult (Fig. 113): Distinguished from *Asaperda agapanthina* Bat. by monochromatic grayish pubescence and from *A. rufipes* Bat. by fine longitudinal striation on elytra. Body elongate. Head short, with dense adherent gray pubescence, between antennae with broad trough, with narrow median longitudinal groove. Antennal tubercles insignificantly produced. Temples moderately projecting, hind clivus with numerous bristles. Eyes barely convex, finely faceted, broadly emarginate. Genae two-thirds length of lower ocular lobe. Antennae longer than body, extending beyond apex of elytra by 10th or 11th segment, on inner side of 1st–8th segments with dense, somewhat rusty bristles. First antennal segment thick, with fine punctation, distinctly shorter than 3rd segment; latter equal to 4th segment.

Pronotum transverse, laterally with large acute conical tubercle, disk uniformly convex, apically with broad and basally with narrow transverse groove, with insignificantly arched posterior margin, with minute adherent, somewhat rusty hairs, laterally with long bright bristles. Pronotal shield slightly tapering posteriorly, apically broadly rounded, with short adherent gray hairs.

Elytra parallel-sided, elongate, apically with narrowly rounded inner and gently sloping outer angle, disk uniformly convex, with minute uneven punctures forming here and there longitudinal rows, with fully perceptible

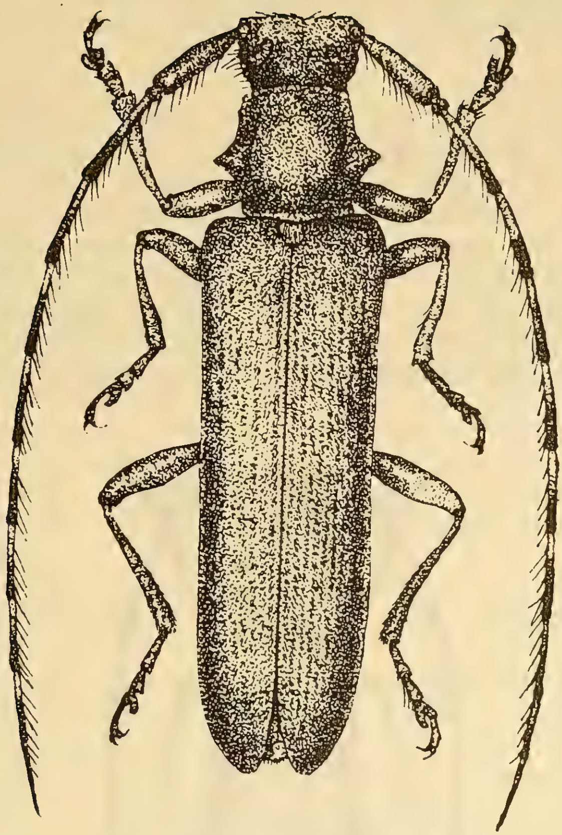


Fig. 113. *Asaperda meridiana* Matsush.

207 narrow longitudinal grooves, with uniform short adherent monochromatic gray hairs not forming specks. Legs not very long, hind femora barely reaching posterior margin of sternite II, insignificantly longer than tibiae, with compact adherent gray hairs, on tibiae additionally with thin bristles. Midtibiae at outer margin with narrow oblique distal notch. Hind tarsi shorter than tibiae, their 1st segment distinctly shorter than next two segments together. Body ventrally with compact adherent gray hairs and bright semierect bristles. Abdominal sternite V transverse, apically broadly rounded. Body black or blackish-brown. Antennae rusty, segments terminally with barely perceptible brownish tinge. Legs rusty, tarsi brownish. Body length up to 10.5 mm.

Material: Adult insects collected on Kunashir Island by G.O. Krivolutskaya. Larvae and pupae not known.

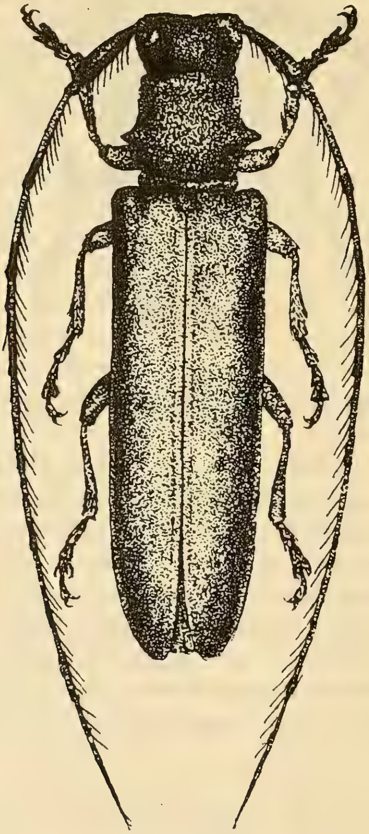
Distribution: Kunashir, Taiwan, southeast China.

Biology: Beetles fly in July, infest broad-leaved and mixed forests.

3. Asaperda rufipes Bat.

Bates, 1873. *Ann. Mag. Nat. Hist.*, 4, 12: 386; Kojima and Okabe, 1969. *Food Plants of Japan, Cerambycidae*, 57, 202; Kojima and Hayashi, 1969. *Insects' Life in Japan*, 1: 99; Cherepanov and Cherepanova, 1981. *Nasekomye i kleshchi Sibiri (nov. i maloizv. vidy fauny Sibiri)*, 48–49.

Adult (Fig. 114): Characterized by deep interlacing punctation not forming perceptible longitudinal rows on elytra, rusty legs, and comparatively dense pubescence. Body elongate. Head with compact deep minute punctation and yellowish-gray hairs not forming continuous pubescence (because of which punctation very distinct), beyond eyes on temples with



208 Fig. 114. *Asaperda rufipes* Bat.

solitary bristles not forming clusters, with antennal tubercles extended laterally, medially with distinct longitudinal groove. Eyes finely sharp faceted, on inner side not incised almost up to posterior margin; interspace of ocular lobes very narrow, less than half width of upper ocular lobe. Antennae longer than body, their 9th–10th segments extending beyond apex of elytra, with very short sparse adherent hairs, on inner side of 1st–6th segments with long projecting bristles. First antennal segment thick,
208 with minute punctation, considerably shorter than 3rd, which is almost equal to 4th.

Pronotum oblong, slightly longer than basal width, beyond middle with small, acutely produced, lateral tubercle, basally with narrow sharp flange, with recurved posterior margin (in *Asaperda agapanthina* Bat. posterior margin of pronotum not recurved), in anterior third with barely perceptible (especially laterally) transverse trough, disk uniformly convex, with minute compact punctation and dense compact adherent yellowish-gray pubescence, laterally with solitary bristles or without them (in *A. agapanthina* Bat. pronotum laterally with long thin bristles). Pronotal shield small, not longer than basal width, posteriorly gently rounded, with dense compact adherent hairs.

Elytra elongate, parallel-sided, with humeri straight, humeral tubercle barely projecting, inner to it with barely perceptible depression, apically separately rounded, hind clivus with perceptible narrow perisutural groove, disk uniformly convex, with interlacing uniform deep punctation not forming longitudinal rows but covered with dense adherent yellowish-gray pubescence. Legs comparatively short, femora moderately thickened, with very sparse adherent gray hairs, midtibiae at outer margin with distal notch fringed with brush of short dark brown bristles. Hind tarsi distinctly shorter
209 than tibiae, their 1st segment considerably longer than 2nd. Body ventrally with dense compact adherent white pubescence and solitary semierect bristles. Abdominal sternite V obtuse or rounded. Body and elytra black. Antennae basally rusty, their 1st and 2nd segments and apex of remaining segments black. Femora and tibiae rusty, tarsi black (f. typica) or femora darkened, tibiae and tarsi rusty. Body length 8–10 mm.

Larva (Fig. 115): Distinguished from the larva of *A. agapanthina* Bat. by location of hairs on the temporo-parietal lobes and other characters. Head insignificantly retracted into prothorax, slightly tapering anteriorly. Epistoma slightly convex; apically flat, from apex almost up to anterior brownish fringe divided by median longitudinal suture, at anterior margin smooth, with brownish or rusty-brown fringe, behind it with piliform bristles forming two transverse rows, laterally demarcated by distinct white frontal sutures. Hypostoma convex, anterior margin emarginate, somewhat rusty, medially with narrow white longitudinal band, laterally fusing with

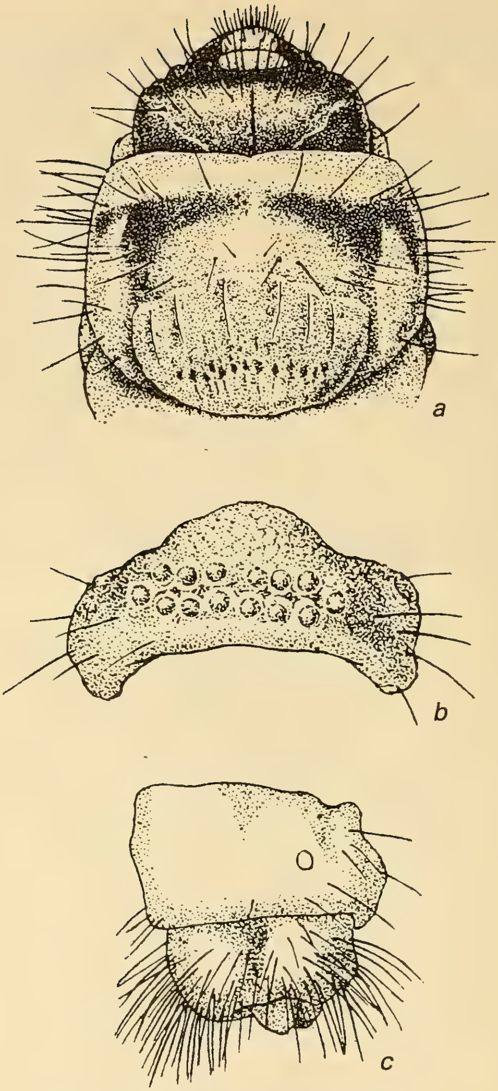


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Fig. 115. Larva of *Asaperda rufipes* Bat.

a—head and pronotum; b—abdominal tergite with dorsal locomotory ampulla; c—tip of abdomen (lateral view).

temporo-parietal lobes; lateral hypostomal sutures not perceptible. Temporo-parietal lobes somewhat rusty, laterally with whitish tone, at anterior margin with narrow rusty or rusty-brown fringe, with long dispersed hairs on almost two-thirds of their anterior part. Antennae very short, whitish, barely projecting from antennal sockets. Ocelli minute, ampullaceous. Clypeus broad, trapezoid, whitish, smooth. Labrum transversely oval, basally somewhat rusty, in posterior half with pair of wide-set long bristles, in front with dense thin bristles. Mandibles red or reddish-rust, only laterally and apically blackened.

Pronotum transversely oval, highly slanting toward head, at anterior margin with whitish fringe, behind it (on disk and laterally) with brownish or brownish-rust area divided medially by longitudinal white band (which enlarges before shield as a whitish triangle), at anterior margin of brownish area with wide-set long hairs forming transverse row, before shield with paired hairs forming interlacing transverse row arched angularly forward. Pronotal shield white, coriaceous, convex, at anterior margin rounded, laterally demarcated by deep longitudinal folds, in posterior half with longitudinal striae, with brownish specklike, barely perceptible spotlets forming transverse row or without them (in *A. agapanthina* Bat. these spotlets distinct, clearly projecting). Prosternum convex, with long hairs, laterally with yellowish glabrous spot, in region of eusternum glabrous, only along circumference with individual hairs, at base (basisternum s. sternellum) medially glabrous, laterally with dense hairs. Meso- and metasterna medially divided by transverse groove; near this groove lie ampullaceous granules forming two transverse rows (six–eight granules in each row). Metanotum and abdominal tergite I with two distinct transverse rows of ampullaceous granules (six in anterior row, eight in posterior).

Abdomen elongate, parallel-sided, laterally with sparse hairs. Spiracles round. Dorsal locomotory ampullae on tergites VI and VII convex, with ampullaceous granules—five–eight much larger granules forming posterior row, three–six smaller granules forming anterior. Abdominal sternites VI, VII on disk convex, shagreen, with ampullaceous granules forming two transverse rows—posterior row distinct, anterior row faint. Abdominal
210 segment IX transverse, cylindrical, in posterior half with longitudinal folds, with dense setiform hairs fringed basally with sclerotized ringlet. Body length about 15 mm, width of head up to 2.0 mm.

Pupa: Very similar to the pupa of *Asaperda agapanthina* Bat. Judging by exuviae, distinguished from it by much denser bristles on tergites and tip of abdomen. Urogomphus at tip of abdomen highly extended, terminating in short sclerotized spinule.

Material: Collected in the Ussuri-Primor'e region (Blagodatnoe). Adults two (male and female), larvae two, larval and pupal exuviae with beetles from cells two.

Distribution: Ussuri-Primor'e region, Japan. Rare species on the continent.

Biology: Infests deciduous plantations. Ecologically associated with alder (*Alnus*). Beetles fly in the first half of summer. They do not visit flowers. Females lay eggs at the top of thin shoots of viable trees of alder. Larvae make gallery in wood under bark, nibble ventilation holes in the wall of the gallery and discard fine frass through them. Gallery remains hollow. Width of gallery up to 3.0 mm. Larvae make a pupal cell at end of gallery and separate it from the hollow gallery with a plug of coarse fibrous frass. The end (anterior) part of the cell is packed with fine frass consisting of wood and bark. Length of cell 21 mm, width 2.5 mm, length of plug separating cell from hollow gallery 5.0 mm. Length of plug in terminal part of cell 6.0 mm.

Asaperda rufipes Bat. is found quite rarely and observed only on alder (Cherepanov and Cherepanova, 1981). It develops on shoots of *Acer rufinerve*, *Fraxinus spaethiana*, and *Morus bombycis* in Japan (Kojima and Okabe, 1960).

4. **Asaperda stenostola** Kr.

Kraatz, 1873. *Deutsche Ent. Zeitschr.*, 23: 227; Yakobson, 1911. *Zhuki Rossii*, tabl. 71, fig. 25; Cherepanov and Cherepanova, 1981. *Nasekomye i kleshchi Sibiri* (*nov. i maloizv. vidy fauny Sibiri*), 45–48.

Adult (Fig. 116): Well distinguished from other species by short, less elongate body, black legs, and other characters. Body short, insignificantly elongate. Head short, broad, with median longitudinal groove and compact deep punctation, frons with white fluffy, sinciput and occiput yellowish adherent hairs, temples erect dense setiform brownish hairs. Antennal tubercles slightly extending laterad. Eyes minutely and sharply faceted, deeply incised; interspace between ocular lobes less than half width of upper lobe. Antennae longer than body, extending beyond apex of elytra by 10th–11th segment, with sparse short adherent hairs, on inner side with long projecting bristles. First antennal segment thickening toward apex, compactly punctate, not shorter than 3rd segment.

Pronotum transverse or almost transverse, laterally with insignificantly produced acute tubercle, basally with sharp transverse flange, in anterior third without perceptible transverse groove, disk uniformly convex, with compact fine punctation and very short, dark brown adherent hairs not forming continuous pubescence, laterally with long erect dark brown hairs. Pronotal shield broad, slightly convex, posteriorly broadly rounded, with dense adherent grayish-brown hairs.

Elytra insignificantly elongate, parallel-sided, apically individually rounded, humeri straight, near humeral tubercle on inner side with barely
211 perceptible depression, disk uniformly convex, with deep bold punctation and minute adherent yellowish-brown hairs not forming continuous pub-

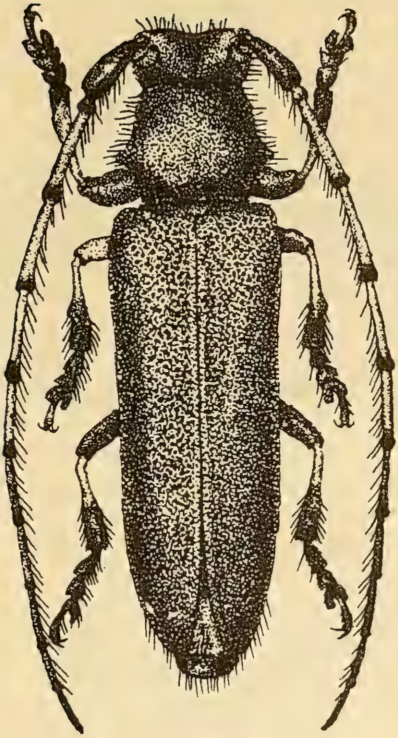
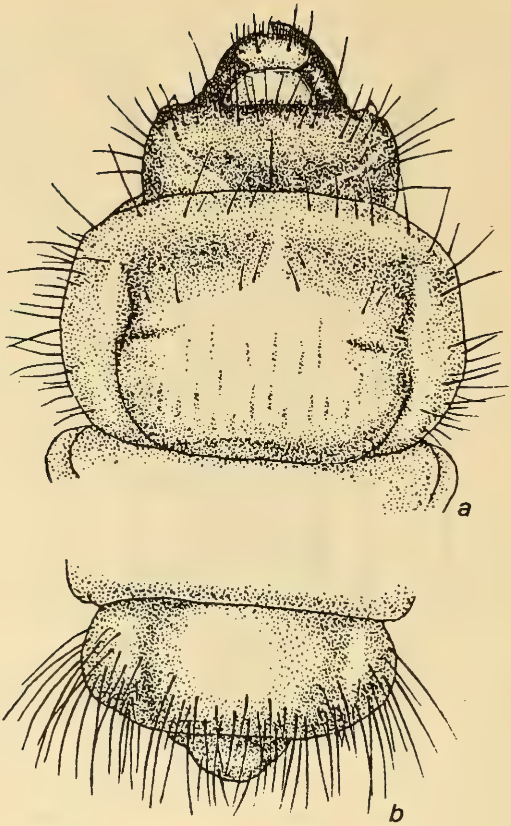


Fig. 116. *Asaperda stenostola* Kr.

escence. Body ventrally with adherent and semierect gray hairs. Sternite V of abdomen apically obtuse or slightly emarginate. Femora thick, tibiae thickening toward apex, on outer side with long piliform bristles, hind tarsi slightly shorter than tibiae. Body and elytra black. First and 2nd antennal segments black, remaining segments rusty, only apically black. Legs black, tibiae in proximal part somewhat rusty. Body length 6–7 mm.

Larva (Fig. 117): Distinguished from the larva of the closely related species *A. agapanthina* Bat. by the location of hairs on pronotum and presence of two pitlike depressions on abdominal sternite IX. Head insignificantly retracted into prothorax, slightly tapering in anterior third. Epistoma rusty or bright rust, in posterior half divided by median longitudinal suture, laterally demarcated by sharp white frontal sutures, at anterior margin with dark brown or somewhat rusty fringe, behind it with thick bristles (five bristles paramedially) fringed basally with sclerotized ringlet and forming distinct uniform transverse row; farther behind with thin fringed



212 Fig. 117. Larva of *Asaperda stenostola* Kr.
a—head and pronotum; b—tip of abdomen.

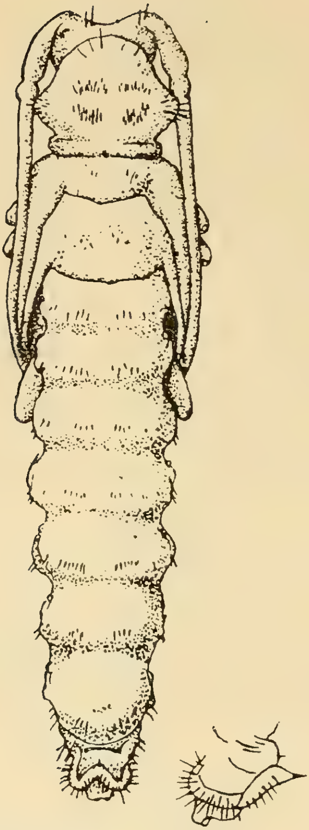
bristles (three bristles on each side) forming a second transverse row. Hypostoma insignificantly convex, somewhat rusty, with distinct or faint median longitudinal white band, near anterior margin with pair of wide-set bristles inclining backward, with two less wide-set bristles forming two transverse rows (lateral bristles also included in anterior row; hence anterior row comprising four and posterior two bristles), laterally fusing with temporo-parietal lobes (lateral hypostomal sutures not developed). Temporo-parietal lobes somewhat rusty, laterally with whitish tinge, at anterior margin with narrow rusty-brown fringe not covering ocular-antennal zone posteriorly, in anterior half with long bristles forming two transverse rows. Antennae short, their apices barely projecting from antennal sockets. Ocelli ampullaceous, pigmented, closer to base of antennae. Clypeus broad, barely tapering anteriorly, hyaline, whitish. Labrum transversely oval, whitish, only basally with brownish tone, in anterior half with dense bright bristles. Mandibles apically obliquely truncate, with acute ventral denticle, along margins and at apex black, mediobasally red.

Pronotum parallel-sided, disk sufficiently convex, sloping toward apex, at anterior margin with whitish fringe, behind it with somewhat rusty or rusty-brown lustrous area divided by white median longitudinal band, at
212 anterior margin of this area with long, somewhat rusty hairs forming uniform transverse row, before shield with solitary randomly dispersed hairs, laterally with triangular rusty or rusty-brown spot, with long, not dense hairs. Pronotal shield convex, white, not sclerotized, laterally demarcated by deep longitudinal folds, at anterior margin rounded or medially slightly produced, in posterior half with brownish spotlets forming transverse row medially bent angularly forward. Prosternum with long sparse hairs, laterally with small yellowish glabrous spot. Eusternum convex, glabrous, along circumference with solitary, somewhat rusty hairs. Base of prosternum (basisternum s. sternellum) medially glabrous, laterally with dense short hairs. Meso- and metasterna with median transverse groove bordered by round ampullaceous granules forming two rows.

Abdomen parallel-sided, laterally with long bright hairs. Dorsal locomotory ampullae developed on abdominal tergites I, VI, VII and on metanotum, with large ampullaceous, nonsclerotized granules forming two transverse rows divided by deep longitudinal groove. Granules on metanotum and on abdominal tergite I uniform, distinctly demarcated; granules of anterior row on abdominal tergites VI and VII reducing, indistinctly demarcated. Ventral locomotory ampullae developed on meso- and metasterna and on abdominal sternites VI–VII. Segment IX of abdomen obtuse, along margins with dense long, somewhat rusty hairs forming here a dense
213 tuft. Sternite IX laterally with pitlike depression. Body length up to 10 mm, width of head 1.7 mm.

Pupa (Fig. 118): Body elongate. Head projecting. Frons broad, medially between antennae with longitudinal groove, near antennal base, closer to frons, with solitary bristles. Pair of close-set bristles beyond eyes. Antennae flexed laterad, in second half bent ventrad looplike, with apices directed forward.

Pronotum convex, tapering toward both apex and base, laterally with produced, densely setigerous tubercle, near posterior margin with narrow transverse groove, at anterior margin with solitary bristles, medially with minute piliform bristles forming a transverse band, hind clivus with bristles forming two diverging bands which together with transverse band constitute a triangle. Mesonotum transverse, at posterior margin broadly rounded, laterally with solitary bristles. Metanotum slightly convex, in posterior half with two clusters of paramedial bristles.



212 Fig. 118. Pupa of *Asaperda stenostola* Kr.

Abdomen elongate, almost parallel-sided, tapering slightly at apex. Abdominal tergites convex, divided by common median longitudinal groove, at posterior margin with minute acute setiform spinules on papillate coriaceous base forming transverse row interrupted medially. Tergite VII posteriorly broadly rounded, disk convex, near posterior margin with individual spinules and bristles. Tip of abdomen obtuse, laterally bound by broad setigerous ridge, reverted to dorsal side as urogomphus terminating in an acute sclerotized dark brown spinule. Valvifers of female small, digitate. Body length 9.0 mm, width of abdomen about 2.0 mm (Cherepanov and Cherepanova, 1981).

Material: Collected in the Ussuri-Primor'e region. Adults two (male and female) (raised from larvae in the laboratory), larvae five, pupae two (raised into beetles), exuviae of larvae and pupae with beetles from cells two.

Distribution: Ussuri-Primor'e region: from Blagoveshchensk, Khabarovsk region to Vladivostok. We found it in the Ussuriisk region.

Biology: Infests broad-leaved forests. Ecologically associated with *Maakia amurensis*. Flight of beetles in June and early July. Beetles do not visit flowers. The female lays eggs at the apex of thin shoots (knots) of viable trees. Larvae make gallery through the heartwood from apex toward base of shoot, nibbling ventilation holes outward on the way, and discarding fine frass through them. Larvae of last instar in spring make a cell at end of gallery, separate it from gallery by a plug of frass, and then pupate. Larval gallery hollow throughout its length, not packed with frass. Length of larval gallery up to 15 cm, length of pupal cell 11 mm, width 4.0 mm. Pupa develops in about two weeks. In the laboratory a larva pupated on November 22nd and the beetle emerged from it on December 4th; another larva pupated on December 3rd and the beetle emerged on the 17th day of this month. The atmospheric temperature fluctuated from 14.0°C to 19.5°C. Based on two individuals, larvae before pupation weigh 13.8 mg (male)—20.1 mg (female), pupae 11.4–17.7 mg, beetles after emerging from cells 8.8 mg (male)—13.8 mg (female). During metamorphosis, the weight of the male reduced by 39.2% and that of the female by 31.4%. We found *Asaperda stenostola* Kr. only on *Maakia amurensis* and no other plant species (Cherepanov and Cherepanova, 1981).

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2. Genus *Microlera* Bat.

Bates, 1873. *Ann. Mag. Nat. Hist.*, 4, 12: 380; Kojima and Hayashi, 1969. *Insects' Life in Japan*, 1: 98.

Adult: Characterized by small body. Head with deep punctation, sparse minute hairs, and insignificantly wide-set antennal tubercles with deep longitudinal groove between them. Pronotum laterally rounded, beyond middle roundly (*Microlera ptinoides* Bat.) or angularly (*M. ussuriensis* Tsher.) enlarged, with sparse minute hairs not forming continuous pubescence, with deep bold punctation. Elytra tapering toward base, disk beyond shield more (*M. ptinoides* Bat.) or less (*M. ussuriensis* Tsher.) depressed, here as if with flange, with deep bold, only on hind clivus vanishing punctation, with white or gray pilose, more (*M. ptinoides* Bat.) or less (*M. ussuriensis* Tsher.) distinct bands, at posterior edge (apex) with bristles forming transverse row. Larvae and pupae not known.

This genus includes three species—two found on Pacific Ocean islands and one on the continent in northern Asia (Ussuri-Priomor'e region).

Type species: *Microlera ptinoides* Bates, 1873.

KEY TO SPECIES

1 (2). Elytra with sharp white pilose transverse band, basally red . . . . **1. M. ptinoides** Bat.

2 (1). Elytra with barely perceptible white pilose transverse band (beyond middle), basally monochromatically brown, not red. . . . . **2. M. ussuriensis** Tsher.

1. Microlera ptinoides Bat.

Bates, 1873. *Ann. Mag. Nat. Hist.*, 4, 12: 380; Gressit, 1951. *Longic. Beetles of China*, 2: 493; Kojima and Hayashi, 1969. *Insects' Life in Japan*, 1: 98–99.

Adult (Fig. 119): Characterized by small body, elytra highly tapering (as if overextended) basally, and bold punctation. Head highly bent toward forecoxae, perceptibly tapering beyond eyes, with compact deep punctation, glabrous, without pubescence, medially with narrow longitudinal groove. Antennal tubercles barely produced, insignificantly wide-set. Eyes barely convex, finely faceted, highly emarginate. Antennae comparatively thick, their apices extending beyond hind clivus of elytra, with minute adherent hairs not forming continuous pubescence, with vanishing, faint

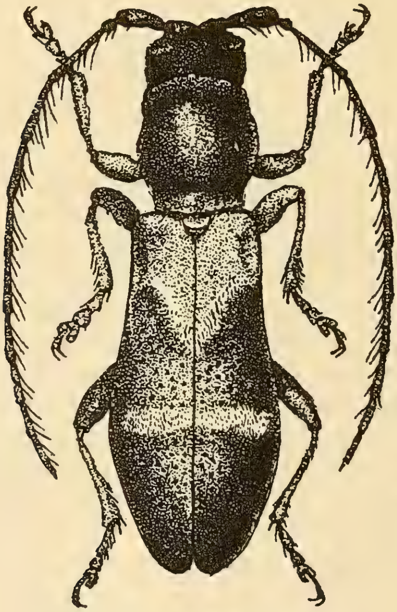


Fig. 119. *Microlera ptinoides* Bat.

punctation, on inner side with long setiform erect bristles, their length not less than length of segments per se. First antennal segment thickening medially, tapering toward apex, apically rounded. Third segment considerably longer than 4th, equal to 1st.

Pronotum slightly oblong, laterally tubercularly rounded, tapering more toward base, less toward apex, in posterior third parallel-sided, disk uniformly convex, with very short sparse hairs (appearing glabrous), with compact coarse punctation; spaces between punctures smaller than punctures. Pronotal shield semicircular, with minute adherent gray hairs.

Elytra distinctly enlarged posteriorly from base, roundly tapering in posterior third, apically individually rounded (with narrowly rounded inner
215 angle), with straight, not projecting humeri, in posterior half flasklike, convex, beyond shield on disk transversely (flatly) depressed, here as though transversely overextended, with deep bold striae, hind clivus with vanishing punctation and sparse adherent hairs, at posterior margin (apex) with thick acicular bristles forming transverse row, beyond middle with white pilose transverse band, in anterior third in region of gentle depression with white pilose, more or less broad spot. Legs with sparse adherent gray hairs. Femora thick, perceptibly dilated. Midtibiae at outer margin with small distal notch. Hind tarsi slightly shorter than tibiae; 1st segment of hind tarsi equal to next two segments together. Body blackish-brown. Antennae rusty. Pronotum at posterior margin sometimes somewhat rusty. Legs dark brown, tibiae and tarsi somewhat rusty or entirely rusty. Elytra black or dark brown, basally rusty. Body length 3.5–4.0 mm.

Material: Collected on Kunashir Island (Alekhino). Adult insect one. One beetle received from Japan.

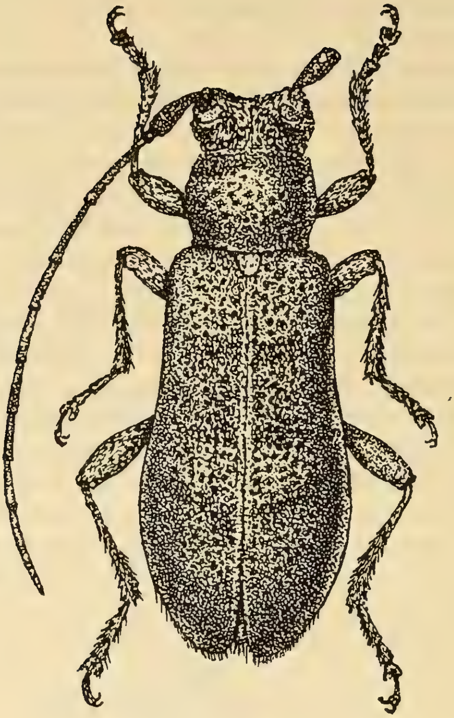
Distribution: Kunashir Island, Japan, Taiwan.

Biology: Flight of beetles begins from mid-June. Biology of larvae not yet studied.

2. **Microlera ussuriensis** Tsherepanov, sp. n.

Adult (Fig. 120): Distinguished from *Microlera ptinoides* Bat. by elytra less produced basally and pronotum weakly tapering toward base. Head beyond eyes almost parallel-sided, with uneven deep punctation, sparse adherent gray hairs not forming continuous pubescence, between antennae with deep median longitudinal groove, with insignificantly wide-set antennal tubercles. Eyes slightly convex, broadly emarginate, finely faceted. Antennae slightly shorter than body or almost reaching apex of elytra, with sparse, very minute, barely perceptible hairs, appearing glabrous. First antennal segment with compact coarse punctation, 3rd segment distinctly longer than 4th.

Pronotum almost square, length barely more than basal width, beyond



216 Fig. 120. *Microlera ussuriensis* Tsher.

middle angularly enlarged laterally, almost uniformly tapering toward apex and base, disk uniformly convex, with very deep bold punctation, distance between punctures slightly smaller or not smaller than punctures, with sparse minute gray, backwardly inclined hairs not forming continuous pubescence. Pronotal shield barely oblong, slightly tapering posteriorly, apically rounded, with dense adherent gray hairs.

Elytra insignificantly enlarged posteriorly from base, roundly tapering in posterior third, apically individually rounded, with straight humeri, here perceptibly broader than pronotum, in posterior half moderately convex, disk beyond shield barely perceptibly, gently (flatly) depressed, with deep very bold punctation perceptibly vanishing on hind clivus, with short uni-
216 form adherent gray hairs not forming dense continuous pubescence, only beyond middle with barely perceptible, whitish pilose transverse band, apically with thin piliform bristles forming compact transverse row along posterior margin. Legs with sparse minute gray hairs. Hind femora elon-

gate, slightly enlarged. Midtibiae at outer margin with deep distal notch. Hind tarsi insignificantly shorter than tibiae, their 1st segment not longer than next two segments together. Body ventrally with sparse adherent gray hairs. Abdominal sternite V apically broadly rounded, at posterior margin with long bright bristles forming compact transverse row. Body and antennae dark brown with somewhat rusty tone. Legs and elytra brownish with somewhat rusty tone. Body length 5.0–6.5 mm.

Material: Collected in the Ussuri-Primor'e region. Holotype—male, Osinovka, VII 1917 (El'skii!); paratypes—two (male and female), Dal'-norechensk (Great Ussurka River), 30.VI–29.VII 1931 (Shabliovskii). A rare species. During many years of field work, we have not found it in the aforementioned region.

ADDENDUM

V. Subfamily Cerambycinae

20. Tribe CALLICHROMINI

2. Genus *Chloridolum* Thoms.

217 1. **Chloridolum sieversi** Ganglb.

Cherepanov, 1981. *Usachi Severnoi Azii* (Cerambycinae), 93–97.

Previously the focus of mass breeding of *Chloridolum sieversi* Ganglb. was found in plantations of Manchurian walnut (*Juglans manshurica*). Larvae were found under bark and in wood. They infest the stems of drying but still rooted standing trees. In 1980, this species was found in freshly felled oak trees (*Quercus mongolica*) uprooted by high spring floodwaters. The trees were infested by the beetles up to the floodwater level. One stem of an oak tree was infested by midinstar larvae almost throughout its entire thick part (diameter at basal underground zone 60 cm, at apex 20 cm). It was established on cutting the bark of this stem that the larvae live under bark, make squarish galleries impressed gently on sapwood, and fill them with fine frass. Length of gallery under bark 16.0–19.5 cm, width 1–5 cm. Larvae of late instars bore into wood, leaving an entry hole longitudinal to the stem on the surface, and plug it with frass. Width of entry hole 0.9–1.5 cm. Larvae make longitudinal galleries at a depth of 3–6 cm and do not fill them with frass. Nine larval galleries were found in a stem section 48 cm long, 16 cm wide, and 41 cm thick. Similar damage was done almost throughout the entire length of the stem. The periods of development of this species on oak coincide with development on Manchurian walnut. Weight indices of specimens developing on both these plant species vary almost within the same range: on oak, larvae before pupation weigh 445–795 mg, pupae 404–722 mg, adults 320–671 mg; on Manchurian walnut: 295–885.5 mg, 218–805 mg, and 191–609.9 mg respectively. These observations show that *Chloridolum sieversi* Ganglb. in the forests of Ussuri-Primor'e region can cause significant damage to mature plantations of oak and Manchurian walnut. Forests infested by this species require sanitary felling of trees.

23. Tribe CLYTINI

1. Genus *Xylotrechus* Chevr.

16. **Xylotrechus nadezhdae** Tsher.

Cherepanov, 1982. *Usachi Severnoi Azii* (Cerambycinae, Clytini, Stenaspini), 63: 68.

In 1980, *Xylotrechus nadezhdae* Tsher. was found on thick-stemmed trees of Maximovich poplar (*Populus maximoviczi*) uprooted by high floodwaters. In 1982, this very species was found by us on the stem of a *Chosenia arbutifolia* growing on the bank of a rivulet near the village Lazo. The diameter of this stem at chest height was 20 cm. The region of beetle
218 infestation was located on the southern side of the stem and occupied a portion 0.5 m long and 27 cm wide at a height of 2.0 m from the root neck. Larvae make sinuous galleries impressed on sapwood and inner side of bark. Galleries are contiguous, sometimes fusing with each other, and packed with fine frass consisting of bark and wood. Larvae of late instars bore into the wood, making a falcate gallery, then fashion a cell in the upper layer of the wood longitudinal to the stem. They then nibble an exit hole outward in this cell and plug it compactly with frass. The exit hole made in the cell is generally located near the entry hole, which persists as the larva bores deeper into the wood. A dry rim forms at the site of larval infestation. The tree continues to grow by the formation of a callus on the opposite side. *Xylotrechus nadezhdae* Tsher. is found comparatively rarely. Nevertheless, by infesting viable trees it can cause considerable damage to *Chosenia*-poplar plantations.

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